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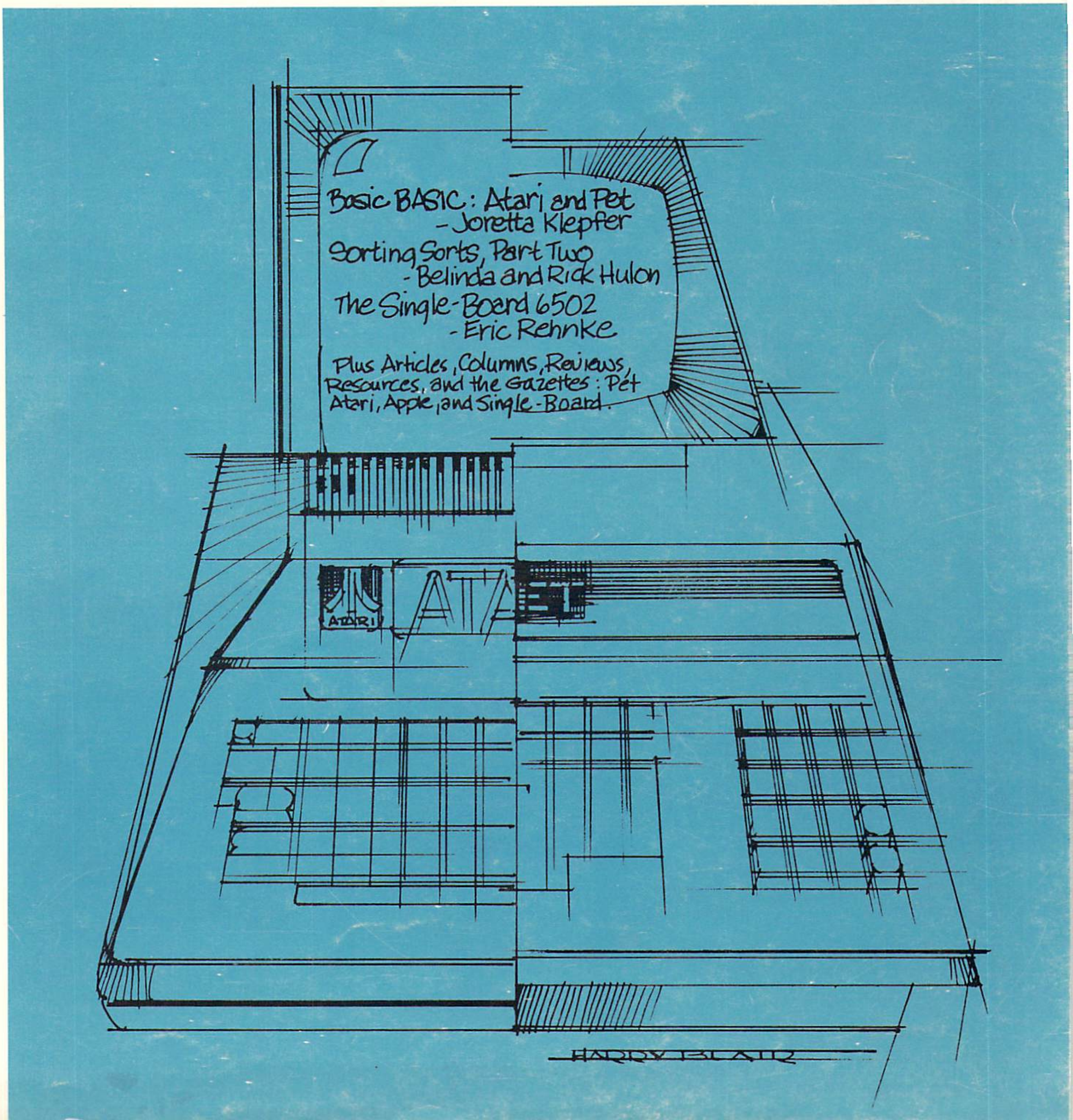
COMPUTE.

The Journal for Progressive Computing™



Basic BASIC: Atari and Pet
- Joretta Klepfer

Sorting Sorts, Part Two
- Belinda and Rick Hulon

The Single-Board 6502
- Eric Rehnke

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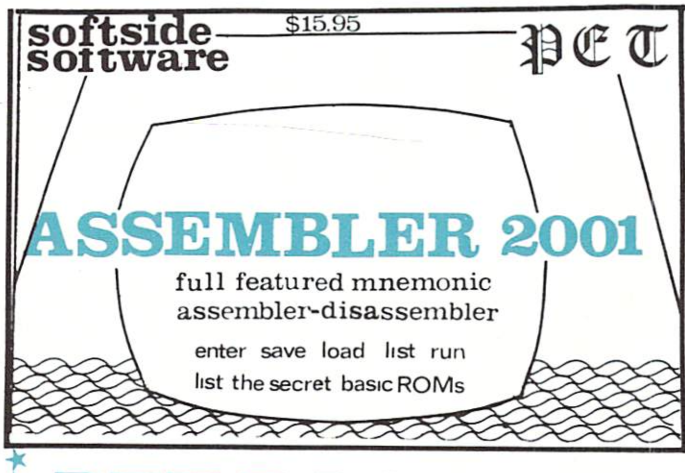
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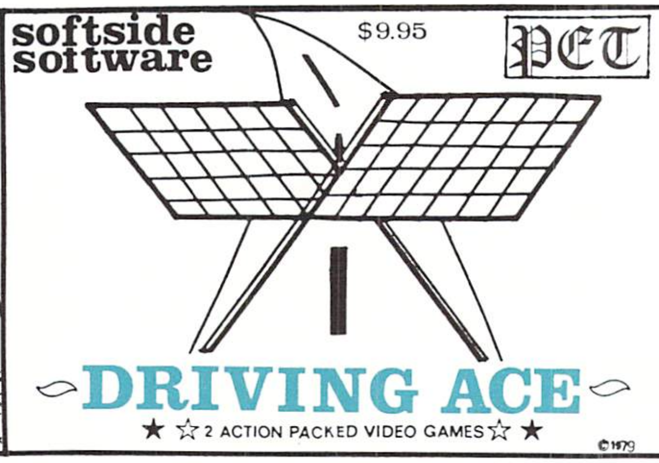
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- 255 CHAR. LINES

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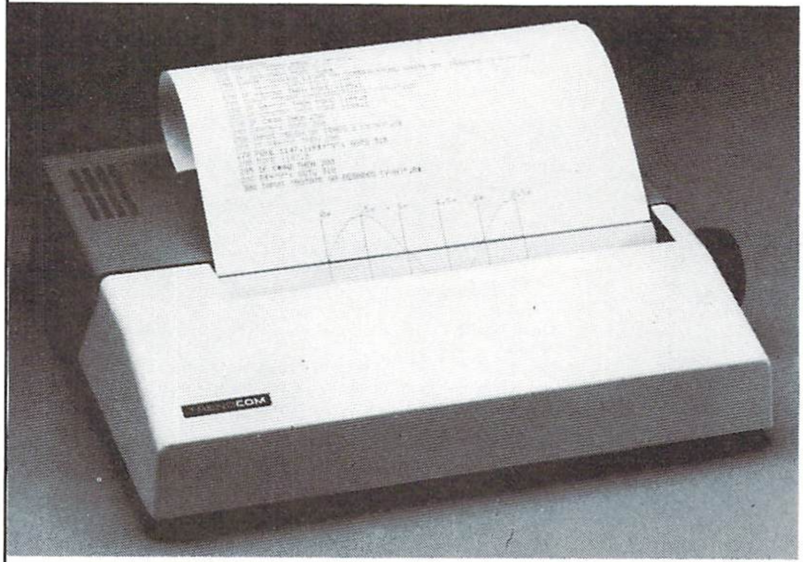

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The Editor's Notes

Robert Lock

As you may have noticed, COMPUTE's January-February Issue is larger than our premier "Super" Fall Issue. We've changed our paper quality somewhat to allow more pages and less weight.

COMPUTE GROWS ON

We began, as most of you readers know, by acquiring The PET Gazette, a magazine started by Len Lindsay almost two years ago. Len Lindsay's PET Gazette is gone, and a section of COMPUTE now carries that title. Len continues to provide material to COMPUTE, as well as many other magazines. (Rumor even has it that Len is hard at work on two books for a west coast publishing house: One for PET and one for Atari! I'll keep you posted.) In this issue, you'll find his brand new column, **The Consumer Computer,** a Column devoted to the joys of the personal 6502.

Pet User Notes is now a part of COMPUTE. Originally started by Gene Beals, of AB Computers, the Notes were more recently the product of Roy O'Brien. When job responsibilities and a west coast transfer created more than usual problems in keeping up the Notes, Roy and Gene and I got together on an orderly "cross-over" of the Notes into COMPUTE.

6502 User Notes is now a part of COMPUTE. This is the oldest of the magazines to join COMPUTE. Founded by Eric Rehnke almost three years ago, the 6502 User Notes bring a welcome readership to COMPUTE. With the help and contributions of this group, you'll see a very healthy Single Board Computer section of COMPUTE.

So where do we go from here? We're determined to build a broadly supported 6502 resource magazine. We've recruited the continuing support of some of the best writers in the industry. Take a look through our continuing features... new this issue, and ENJOY COMPUTE! Happy New Year from all of us. We're looking forward to it.

Introduced In this Issue:

Dr. Chip and the Gossip Club

This multi-facited sage will continue to impart wisdom (?) and rumor with the help of his Gossip Club.

The Consumer Computer

Len Lindsay writes and reviews on the personal 6502 market.

The Tape Library

Gene Beals handles this corner of COMPUTE. Each issue you'll find notes and comments on the sharing and swapping of user generated programs.

Rambling

Roy O'Brien provides an illustrated guide to the inner workings of some particular whatsit. This time, he covers CB2 sound for the PET.

The Single-Board 6502

Eric Rehnke addresses (and sometimes affronts) the Aim, Sym, Kim, and OSI markets.

The Learning Lab

Marlene Pratto, of COMPUTE's staff, offers helpful advice for those involved in the use of microcomputers in schools.

As time permits...

Also new this issue is **The Delmarva Computer Club.** This exciting group of 6502 owners is somewhat unique. They're a club that's dedicated itself to numerous public service projects, and they'll be providing continuing resource support to COMPUTE. Comprised largely of NASA employees at the Wallops Island Space Center, the Club is involved in an active "outreach" program to the surrounding community. Among other things, they have (or are working on) projects to teach the manual alphabet to the hearing-impaired (using PET graphics); the Texas Instruments Speak and Spell interfaced to the PET to help visually-impaired persons learn the keyboard; and much more. They'll be sharing these efforts in future issues of COMPUTE. Their introductory article is in this issue.

On the importance of feedback:
COMPUTE (as do all magazines) relies heavily on advertising for support. When you contact a COMPUTE advertiser, make sure you let them know where you saw their information. As you hopefully have noticed, COMPUTE strives for quality as well as quantity in providing access to resources. We've just pushed issue # 1 out the door and have already seen an increase in production costs... so much for planning and inflation. We've tried to keep the price of COMPUTE at an easily affordable level while bringing you the best materials around. We welcome your feedback and comments on our success. You can reach me by mail:

Robert Lock, Editor
COMPUTE
P.O. Box 5119
Greensboro, N.C. 27403

Or by phone: (919) 272-4867

The following (excerpted) letter was received from a dealer in early December:

Compute
Please enter our standing order.

We are tentatively starting this order with you. However if you continue to have ads offering 20% discount we will not. It is one thing to advertise $100 free software, it is another to offer 20%--obviously my customers will go to them. I suggest you clean up your advertising act as some other computer magazines have done.

Sincerely,
Name Withheld

Dear (Anonymous) Dealer,
COMPUTE. is a consumer magazine that believes in (among other things) free markets, competition, and open access to resources. I checked with the advertiser in question, and no magazine has refused their ad. I am sorry you have chosen to refuse to carry COMPUTE. I firmly believe that magazines need to "police" their advertising as much as reasonably possible to protect their readers. Stifling competition does not fall into that category.

Dealers offer many services that mail order does not provide, and each potential customer makes his or her own decision, balancing cost economies with service/support economies. It's not my job to make that decision for my readers. If you feel you're being unfairly treated as a dealer, I suggest you complain to the manufacturers involved. I am returning your order to you. Should you decide you wish to carry COMPUTE, without holding us "hostage" to your competitors, we will be more than happy to have you as a dealer.

HELP

We'll begin COMPUTE's HELP Column with the case of Eric of Columbus, Ohio. He's thirteen, and an avid computerist who fell victim to a whole set of problems. We first heard from Eric in September. He wrote that his PET computer, received during Christmas, 1978, was down, and had been since sometime in March of 1979. Here's the saga:

Christmas, 1978: Eric receives PET.
March, 1979: PET fails; message 5119 Bytes free... (a clue, right?)
March, 1979: PET, returned to local dealer, returns to Eric. Eric turns it on, and message: 5119 Bytes free. PET returns to dealer; dealer returns PET to factory...
July, 1979: PET returns to Eric; no charge for warranty repair... $58.00 charge from local dealer for shipping. Eric turns PET on: 5119 Bytes free. Eric returns PET to dealer; dealer returns PET to factory...
August, 1979: Factory informs Eric that they will repair his PET, but he'll have to pay for it, since it is no longer under warranty. Eric's dealer says he can't help. Eric's father starts gnashing his teeth.
September, 1979: Eric wrote to the old PET Gazette for help. Len Lindsay forwarded the letter to me. I finally got to read it in early October, and started reconstructing this entire story.
October, 1979: Eric's PET returns to dealer, and Eric is informed that he can pick it up... it's not repaired, but at least there's no freight charge attached this time...
Late October, 1979: I'm almost as frustrated as the rest of you when it comes to dealing with a problem like this. I thought about going to the upper eschelons at Commodore to solicit help for Eric, but didn't want to make a habit of it. Finally, I called a dealer in Columbus... a COMPUTE. dealer I should say. I've tried to talk to many of them since COMPUTE. has started, and happened to have had several beneficial conversations with this dealer. I knew from our chats that they had a true computer store... one with a strong customer orientation, some in-house service capability, and so on. I called one of the principals at home one night, explained Eric's problem, and gave them his phone number.

Well, I called Eric three nights later, and GUESS WHAT??? His PET is alive and well!!! He took it in and they fixed him right up. Among other things, one of his RAM chips was plugged in backwards! Eric has a working PET... and I'm sure that Micro-Mini World of Columbus, Ohio has a new customer for life. I'm equally sure that there's another dealer in a nearby town that's lost a potentially dedicated customer. (Certainly a determined one.)

My analysis of all of this? At first I was mad at Commodore. After all, they're at the top of the chain on this one; ultimately, Eric's *their* customer. But in reflection, I don't think it's their fault. We know they had problems with turning around machines returned for repair. This says two things: make the machines more reliable, and beef up your local service capability. I believe they've acknowledged and responded to these two points. The present machines shipped by Commodore appear to be quite reliable... and much more so than some of the early, original 8K units. (I'll welcome any support or criticism on this point from you dealers and customers.) This is not to say that there aren't problems. But hardware problems aren't unique to Commodore. As for beefing up the local service capability, they've been conducting dealer training seminars all around the country. And the seminars are well-taught (Rick Lear himself, head of Customer Service). The latest word from Commodore is that dealers are being shipped extensive spare parts inventories!

The real crux of the problem here is the dealer-Commodore relationship. The dealer Eric bought from was probably well intentioned, but still ineffective when push came to shove. Commodore had no way of knowing the history of Eric's problems, or that he is 13, got his PET for Christmas, and had been down and out for 9 months. The local dealer should have known and done something. Even if Eric didn't know about another store with service capability in Columbus, his dealer probably did. He could have arranged to have Eric's PET fixed locally.

Commodore is making a strong move toward small business systems now. They're built the hardware capable of supporting that move, they're developing the marketing insight and strategies to sustain that move, and they're actively recruiting the essential software support necessary. Frankly, the Word Processing packages alone are almost worth the price of the hardware when you compare their capabilities to those of the systems in the $12,000-$15,000 range. More and more dealers will recognize this capability and act on it. Dealers who fail to solve the problems of the Erics will be severely hampered in the small business markets that Commodore is moving into.

One last point... Commodore's service network (there really is one growing) will help us all. My personal belief is that it's as much a byproduct of their small business system move as it is of pressure from the "old-liners", but regardless, it's a welcome move, and will be beneficial to all.

Robert Lock,
Editor/Publisher

the CONSUMER COMPUTER™

LEN LINDSAY

Welcome aboard the Consumer Computer. This column will review products available for your use with your computer. I will also pass on announcements and rumors if I feel they are of sound basis.

Product reviews are of utmost importance in the consumer computer marketplace. You can not believe every ad you read. Actually, just because a product is advertised does NOT mean that it exists. Too many consumer computerists can testify to that. So don't get burned. Heed this warning.

Do NOT buy any computer product unless you are sure it exists.

How can you be sure that a product exists? The best way, of course, is to buy it from your dealer, off the shelf, and walk out with it in your arms. Next best is to see the product with your own eyes at your computer store, computer club meeting, or friends house. These first two conditions are often not possible. Then you must rely on reviews in magazines and newsletters. If you see a product reviewed in my column, you know it exists (announcements can not be considered reviews). And remember, the reviews you read are usually the opinion of one person. You might have a different opinion of the same product.

For over a year I have reviewed PET computer products. I try to point out the important aspects of the program or other product. Most of all, I encourage every reader to write with their conflicting or supporting views. Companies are invited to send products to be considered for review (they will not be returned). All correspondence should be sent to the address listed at the end of this column, not in care of COMPUTE. This will avoid forwarding delays.

ATARI ARRIVES

It has been almost a year now since the ATARI 400 & 800 computer systems were first announced. I can assure you that they do indeed exist, for I have used both models myself, and enjoyed them very much. The system seems to be the start of a whole new generation of computers.

The ATARI system offers the advantage of snap in and out cartridges, allowing you to plug in BASIC, or other high level languages as they are available. Programs will be available both on ROM cartridges and cassette tape. Both upper and lower case is available on the screen, as well as graphics, both in high resolution and full color. A special text window is a handy function built into the system. And the cassette can be used for audio output as well as digital.

The starting price for the ATARI 400 is only $549.99, while the ATARI 800 is $999.99. I am looking forward to reviewing products for the ATARI. If you would like more details on the system, contact ATARI, Computer Division, 1265 Borregas Ave., Sunnyvale, CA 94086.

There already is a book on the ATARI published and available now. ATARI BASIC, by Bob Albrecht, Leroy Finkel, and Jerald Brown is available at your computer store, or direct from John Wiley & Sons, 605 Third Ave., New York, NY 10016. For $5.95 this is an excellent supplement to the BASIC manual provided with the ATARI (or you may wish to read the book to help you decide if the ATARI is right for you).

COMPUTE has a good section for spreading information on the ATARI, as you can see in this issue. The ATARI hopefully is off to a good start. IRIDIS (PO Box 550, Goleta, CA 93017) is a bi-monthly tape of programs for the ATARI, and I am looking forward to seeing their first tape. The same people who put out CURSOR (source of some of the FINEST PET programs) are behind IRIDIS. A subscription for 3 issues is $25.00 (4 programs per issue); a sample issue is $9.95. In addition, other books are in the making, and I am sure clubs will pop up all over.

Something New for your PET

PET
Personal Computer Guide
Carroll S. Donahue
Janice K. Enger

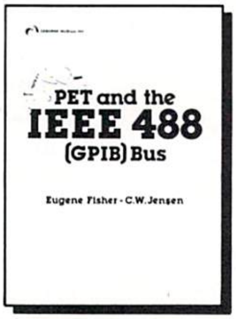
PET Personal Computer Guide

by C. Donahue and J. Enger

Everything you always wanted to know about PET but Commodore didn't tell you. A practical guide to PET programming techniques, graphics, operation, and how to cope with those*&$! PET peculiarities.

#30-6. $15.00

NEW this Winter


PET and the
IEEE 488
(GPIB) Bus
Eugene Fisher · C.W. Jensen

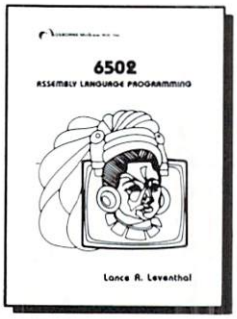
PET and the IEEE 488 (GPIB) Bus

by C. Fisher and C. W. Jensen

This is the only complete guide available on interfacing PET to GPIB. Learn how to program the PET interface to control power supplies, signal sources, signal analyzers and other instruments. It's full of practical information, as one of its authors assisted in the original design of the PET GPIB interface.

#31-4. $15.00

NEW this Winter


6502
ASSEMBLY LANGUAGE PROGRAMMING
Lance A. Leventhal

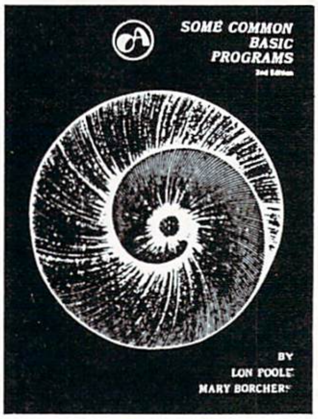
6502

Assembly Language Programming

by L. Leventhal

For the advanced programmer: increase the capabilities and performance of PET (and other 6502-based computers) by learning to program in assembly language.

#27-6. $12.50


SOME COMMON BASIC PROGRAMS
2nd Edition
BY
LON POOLE
MARY BORCHERS

Some Common BASIC Programs

By L. Poole and M. Borchers

This book was designed for people who can use a variety of practical BASIC programs — 76 programs in all that cover a wide variety of personal finance, math, statistics, and general interest topics. The documentation in the book is complete so that you can run the programs even if you aren't an experienced programmer.

#06-3. $12.50

PET owners can purchase the programs ready-to-run on cassette or disk, using the book as a manual for program descriptions, operating instructions and programming options.

Disk #33-0. $22.50 Cassette #25-X. $15.00

SOME COMMON BASIC PROGRAMS
for the TRS-80
TRS-80
SOME COMMON BASIC PROGRAMS
OSBORNE/McGraw-Hill, Inc.
630 BANCROFT WAY, BERKELEY, CA 94710

Book/Cassette/Disk	Price	Quantity	Amount
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06-3 Some Common BASIC Programs (book)	$12.50		
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S1074

A VISIT TO COMMODORE

Monday, November 5, 1979, I was fortunate to be able to visit Commodores computer division in Santa Clara, California. It is quite an impressive place. After seeing the whole operation, I left with the distinct impression that PET is really moving UP in quality, reliability, design, and especially support.

Assembling a PET is quite a process. The room is massive and seemed very organized. Presently the IC's are inserted by machine. A person need only line up the board to the correct position and BANG the IC is in. Soon the process will be entirely automatic. A machine will position the board for each IC and insert them one after another. It then will take the next board and repeat this process.

The original OLD ROM, small keyboard 8K PET is now obsolete. They are no longer manufactured. They are replaced by the new 8K PET, with full sized graphics keyboard and NEW ROMs. The price remains the same at $795. (However, now the cassette isn't built in and must be purchased as an option for $95). Believe it or not, as soon as word was out that the small keyboard model was to be discontinued, many complaints came in, voicing disappointment in this decision. Thus Commodore has decided, that if a good segment wants this style, they will reintroduce it the first quarter of 1980, but with NEW ROMS. Possibly, the fact that it is completely self-contained, with video, tape, keyboard, and memory is a major factor. This certainly is an advantage around children.

The video screen on all PETs now manufactured will be green phosphorus (no more black and white screens). Commodore's cost is about the same for either. But the screen is easier on your eyes. So the PET is moving up in quality.

The base of all PETs remain black metal. But now the case is changing. The Business Model is still ivory metal. But the Large Graphics Model case is now a new, thick, heavy duty type of plastic. It is tested to be just as strong, but it has the advantage of being more uniform, no more worries about the metal bent a bit off in the back. It is the same color and appears identical to it's metal predecessor. Tap on it. It even sounds like metal.

The PET printers now have a newer ROM controller inside, correcting several of the problems found. It now has the option of printing a program listing in graphics or in lower case mode. I always thought it was funny how a the CBM Printer (a smart printer!) was dumb when it came to printing blank lines. If there were 10 blank lines, it would print a whole line of spaces 10 times. The new ROM fixes this for the tractor feed model. A blank line is now treated as a line feed, speeding things up immensely. The friction feed printer still must print a whole line of spaces due to the way its mechanism is set up.

The 2040 Disk units are improved in design and a new ROM operating system should now be ready for release. The heat problem is nicely taken care of. The case design is improved, the top slanted very slightly back, with vent spaces on the top. In addition, it runs much cooler due to improved circuitry which cuts down the power used while it is idle. The new ROM operating system is fantastic. Disk access is easy now, many new commands were added and others simplified. You no longer need to initialize each disk with the new Disk ROMs.

Many new product developments are under way. Their next model microcomputer will probably have 80 character lines with other enhancements. Full color mods for the PET are being worked on as well as speech recognition and even expansion to allow the PET to talk.

Software is also moving along quite well. The packages look good, and come with documentation. Commodore is now also supporting outside independent software houses, and even provides assistance in some cases. They are planning to endorse or recommend software they feel is top quality. Commodores Word Processor programs are definitely first class. See my Word Processor Reviews for more on it.

I imagine that most of you wonder about 2 other major areas - Advertising & Customer Service. Both of these should show a VAST improvement, enough to please even the most critical. Staff has been added and goals have changed, all for the better. A good advertising manager has been hired, and a cohesive advertising and public relations plan is now under way. Customer Service has a new manager who is setting priorities and procedures. Now you can call and get an answer without being referred to 6 people first. Your letters will be answered. If the Customer Support Manager sees a problem in the PET assembly process or one of the parts, he now has complete authority to totally shut down operations while the problem is reviewed and a solution is arrived at.

This has been only a BRIEF summary of a very pleasant and informative visit. Commodore seems to be going all out to stay on top. With a lot of new competition in this market it may be just in time too. There are hundreds of new banners in the Commodore plant. They each say PRIDE. Commodore now has a product that we can be proud of.

THE PROGRAMMERS TOOLKIT

The Programmers Toolkit is a grand collection of utility programs on a ROM for the PET, either OLD or NEW ROMs. With this ROM in your PET your programming chores will be drastically cut. It can automatically number, renumber, or delete lines, append one program to the end of another, dump a list of all variables used with their values, find any string or variable within a whole program, trace BASIC program execution, and HELP you find an error in a BASIC program line. Phew! That was a mouthful. One more time please.

AUTOMATIC LINE NUMBERING.

It will print the next line number for you after each line you enter. It can start at any line and increment in any interval (default numbers by tens starting at 100). Example:
AUTO 1000,20
This will start numbering at 1000 and increment by 20's.

RENUMBER.

Your entire program will be renumbered, beginning with whatever line you specify (100 by default) and incrementing by whatever interval you wish (default by 10). Target line numbers in IF-THEN, GOTO, GOSUB, ON-GOTO, ON-GOSUB, RUN, and LIST are correctly renumbered. As you may have guessed, the command is: RENUMBER.

DELETE.

You can use this command just as you use the PET's LIST command. You can delete a section of lines in the blink of an eye. Example:
DELETE 1000-5000

APPEND.

The APPEND command uses your regular program or subroutine tapes. There is no need to make special ASCII versions (as with conventional methods) of the programs first. This command, combined with DELETE and RENUMBER, allows you to extract pieces from programs and join them together in another, each renumbered as you wish first. You use the APPEND command just like the PET's LOAD command (file name is optional, as with LOAD). Example:
APPEND "EXAMPLE"

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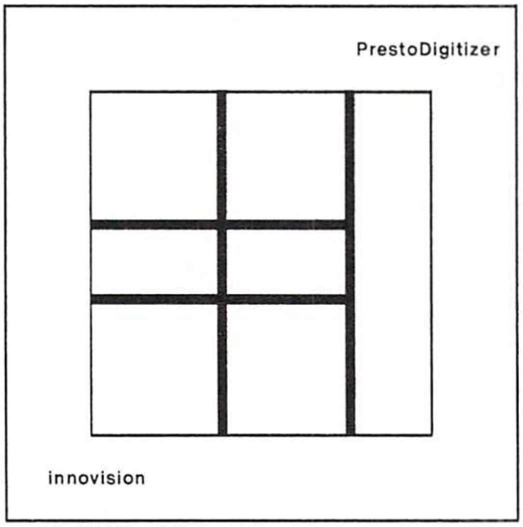

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program, and wondered what variable would be safe to use? Well, your worries are over. Choose the one you would like to use. Ask the PET to FIND it. If it can't find the variable, you are assured it is not yet used in the program. Or perhaps you want to change your variable NAME$ to X$. Find will list EVERY line that uses NAME$ for you, so you can be sure not to miss any. Plus, it can find any string or BASIC command. It can list every line with an INPUT so you can change it to a GET, or whatever.

DUMP.

This feature can be used in the direct mode at any time. It will list all variables presently stored, along with their values. If your program is not working properly, STOP it at several points and look at a DUMP of the variables, and you may be able to figure out what is going wrong.

TRACE.

The Trace function will continually print, in the upper right corner of the screen, the last 6 BASIC lines that were executed. This is a very useful debugging aid. It functions differently than the TRACE program published in COMPUTE last issue (that program listed only the current line being executed, but lists most of the line commands in addition to the line number). You can have the TRACE slow down your program if you wish with a STEP parameter, or turn it off completely with the OFF command.

HELP.

This command will be very helpful indeed, especially to beginning programmers. If a program stops with some error message or another, rather than scratch your head and puzzle over it, type in the command HELP and the PET will LIST the line it had trouble with. In addition to listing the line for you, it will highlight in REVERSE field, the section of the line it was on when the error occured. Well, how about that. The PET can now help you correct your errors.

Programming can actually be fun using the Programmers Toolkit. Since it is a ROM it is instantly available as soon as you turn on your PET and initialize it with a SYS45056 command. It is a product of Palo Alto IC's, 430 Sherman Ave., Palo Alto, CA 94306.

MICRO QUEST/SIMULATION

Automated Simulations (PO Box 4232, Montain View, CA 94040) has come out with the second in their DUNJONQUEST series of fantasy role playing simulation programs for the PET and other personal computers. The first was Temple of Apshai (see my review of it in last issue of COMPUTE). The latest is titled - MORLOC'S TOWER. It is introduced to serves an introduction to computer-aided fantasy role playing games. I am pleased with the preliminary version that I am using. The final version should be available by the end of December. I assume it will come with an excellent professionaly done manual, as with all Automated Simulation products.

Since it is only supposed to be an introduction to role playing, some of the complexities of the set up are left out, but the playing section is complete in its entirety. The manual has a full introductory story, and background information of the world and particular situation you will soon be involved in. Briefly, the situation is this:

You are Brian Hammerhand, back in the good old days. The small village you just walked into seems quite normal, but then there is a bolt of lightning which strikes and destroys the sandal makers shop. It seems that there is a mad wizard in the tower (along with robot guards and other monsters) who has vowed to destroy the village by the next sunrise.

The village hires you to destroy him before there are no buildings left standing in the village. They give you magical armor, large shield, a broad-sword, bow and arrows (some are magical). And so it now is up to you. You enter the tower. As you move about, the rooms you are in, and others you may see through the door, are graphically displayed on your screen along with your vital statistics and information. You move about each room just as in DUNJONQUEST as described in last issue.

This is a real time game. If a monster or robot appears, you only have seconds to decide what to do. Attack? Flee? Fire an arrow? But wait, what is in that box in the corner of the room? The only way to find out is to go over to it and grab it (too bad for you if it was booby trapped and you didn't search it first).

Morloc's Tower is available for $14.95. It should run in both OLD and NEW PETs, but will require at least 16K of free memory (presently requires over 20K, but the final version hopefully will be down to 16K). Automated Simulation hopes that after playing Morloc's Tower, you will want to try their own simulation games. As for myself, I can't wait till the next one is released.

SPACE INVADERS

I have always said that the PET could imitate any of the video games you may find in the ARCADES. Heck, why keep putting quarters in the silly machines when your PET can do the same for free?

Here is an excellent example of a complex, fast-moving, animated, graphically illustrated, arcade game, complete with excellent sound effects - and it runs on the PET. Space Invaders comes from Commodore in Japan. I am not sure how it will be marketed, but it is superb. Hopefully next issue I will have more information (if you can't wait, you might try calling Commodore for up-to-date information).

This video game is virtually identical to the one seen in the ARCADES. You have a sun which glides back and forth across the bottom of your screen. There are several rows of invaders above you, slowly moving back and forth, dropping bombs at you. You try to hit them, and avoid being hit by their bombs. There are some barricades you may hide behind, but their bombs gradually destroy this protection. And the longer you last, the faster the invaders move, and they come closer and closer. I tell you, I played this for hours and could not win. Be careful, it is addictive. I didn't get any of my work done that night.

COMPREHENSIVE AND MASSIVE PET MANUAL

Gregory Yob has been working on a PET User Manual for over a year now. He has 500 pages already done and expects the final version to have about 800 pages. Greg definitely knows what he is talking about, and I am sure the manual will be something every PET User will want to own.

However, it is still not completed. If you sent in your order already, please be patient. Greg has many other activities besides writing the manual, and thus the delays. I haven't given up. It should be worth the wait.

NEXT ISSUE

Well, that's it for now. Next issue I should have a review of ADVENTURE for the PET from Creative Computing. I just received my copy and it seems to work fine. More on the ATARI of course. Maybe some quick reviews of PROGRAMMA INTERNATIONAL (3400 Wilshire Blvd, Los Angeles, CA 90010) programs. I have a copy of all their programs, and they seem to be of very high quality. I hope to hear from you. Let me know what you have seen. Any company who hasn't sent you something you ordered and fully paid for?

Editor's Note:
Len welcomes comments on his column and articles. His address is 1929 Northport Drive, Room 6, Madison, WI 53704.

He requests that you include a self addressed stamped envelope if you wish a reply, but cautions that he cannot reply to every letter.

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Interview with Dr. Chip

(Editor's Note: Dr. Chip is Professor of 6502 Science at Figment University, a little known but widely respected institute of higher learning with branch offices throughout the world. The Figment U. 6502 Users Group, commonly called the Gossip Club, is a group dedicated to the collection of rumors and speculation regarding 6502 products.)

Q: *Doctor Chip, how are the new PET and CBM computers doing? Is their new architecture selling?*

A: I would say yes. There are no official figures, of course; but Commodore have been beefing up their dealerships in the U.S. and seem to be picking up nicely. Oddly enough, Commodore have always done well outside the U.S.A., and their foreign sales look like they are continuing to do well. Our contacts indicate that domestic sales have doubled and perhaps tripled over the past four or five months.

Q: *Has their switch to a new ROM system hurt them at all?*

A: Yes and no. Long-time PET owners were a bit taken aback to see the fairly substantial changes that have taken place in the new machines. Machine language nuts, in particular, were disgruntled to find that they had to redo many of their old programs if they wanted to upgrade, and complained bitterly about the shortage of zero page space in the new system. On the other hand, the new systems look better and work better - and that's never a handicap. Many of the buyers of new systems are first time buyers, and the ROM upgrade is transparent to them.

Q: *Was the new ROM really needed?*

A: Absolutely. It's vital to anyone who wants the disk system. Besides, it gave Commodore a chance to clean up a number of minor problems on the old PET.

Q: *Will there be another ROM upgrade in the near future?*

A: It certainly looks like it. The next one, however, will be less traumatic for us. It will be much more compatible with the last release - at least, it looks unlikely that zero page will be moved around again. And many users won't find it necessary to upgrade at all.

Q: *What are these future ROMs expected to do for us?*

A: Nobody's talking. My guess is that Commodore will fix up the time delays caused by "garbage collection" - a problem that bothers users who deal with a large number of strings. Additionally, they are likely finding that the present disk system is a little complex for the beginning user. I think that they will provide a built-in DOS Monitor -- the program that some people call "the wedge".

Q: *With the same commands?*

A: I suspect they will improve on it. The SHIFT-RUN combination, which currently initiates a tape load, will be re-homed to disk. It will be easier to check disk errors - there may be a new disk status word. One rumoured new command is APPEND, which would allow you to open an existing file and write extra information on it. I think that there will be slightly better support for random access files, too. And, of course, most of the activities currently supported by the DOS Monitor will be built in.

Q: *Is this likely to mean a new hardware announcement, too?*

A: Not necessarily. I think there will be new machines coming, but not tied to the ROM development. Commodore have been dropping interesting hints about new hardware at recent trade shows. The Gossip Club hopes to get to the Consumer Electronics Show in Los Vegas in early January. We expect to see some exciting new products there.

Q: *Like?*

A: The plastic top 8K with standard keyboard is currently shipping. Rumors include color displays; screens with 80-character lines; and built-in disk systems. Lots of new peripherals, of course, but their time frame is rather uncertain. It's interesting to read Commodore's latest annual report - they list an amazing number of new products they hope to have out in the next year or two. I couldn't begin to name them all - but I was particularly interested in their references to an expanded line of printers and disks - including a hard disk.

Q: *Doctor Chip, many PET owners are fanatic about their computers. But Commodore products don't seem to dominate the home computer market. Why is this?*

A: There are many factors, but in my opinion two stand out. Commodore has had production problems, and has not delivered units as quickly as had been promised. Additionally, Commodore has not had a strong dealer network. The two items are related.

Q: *How?*

A: Some retailers tell me that Commodore was very tough to deal with at first. Maybe they thought that they were the only game in town - and, of course, history now shows that they were not. Those dealers who did handle PETs sometimes found that they had problems getting them into stock. Promised peripherals, like the disk and printer, didn't materialize within the indicated time frame; and some dealers started to worry that their own reputations might be harmed by inability to deliver the goods. This didn't help to strengthen the dealer base.

I should emphasize that Commodore was trying its best; they certainly wanted to sell systems. But a number of designs were scrapped, and production problems kept cropping up unexpectedly. And a number of dealers feel, rightly or wrongly, that Commodore kept them in the dark - they didn't communicate.

Q: *Is this still a problem?*

A: Commodore seems to have reformed. A more extensive dealer network is being recruited, and much more support and information is being given to retailers. Service support has been beefed up. There are still production bottlenecks, especially on disk drives, but I get the impression that Commodore is being far more frank in telling dealers what to expect. See Robert Lock's column, "Dealer Notes", elsewhere in this issue for more information. . . he touches on the changes in the Commodore/dealer structure.

Q: *So things are looking up?*

A: Yes; but the real fight is just beginning. There has been an explosion of new personal computer products lately. Many of them have glamour features such as graphics, color, sound and joysticks. Some have quite interesting price tags. Nobody, including Commodore, can afford to be complacent.

Q: *You see the new computer products as serious competition?*

A: Of course. I see the Commodore products as sound and capable of standing up against any of the newcomers - or the oldcomers, for that matter. Cosmetics such as graphics and color look very nice to the casual buyer. But you pay for them, and they often don't translate well to external devices such as a printer. Joysticks and sound - very good sound - can be easily fitted to the PETs. But they are not built in, and may not be visible to the prospective buyer in a store. I think Commodore will need to hustle the many virtues of their computer more than they have done in the past.

Q: *How about software?*

A: It looks like Commodore are finally coming out with high-powered programs. The first version of their word processor has made people sit up and take notice, and there's much more to come, especially in the area of business programs. They recognize the need for sophisticated software support, and seem to be actively recruiting it.

Q: *New languages?*

A: I hear rumours about Fortran, Cobol, and Pascal; but I don't think that they will be in the mainstream of the action. Although computer language experts like to throw bricks at Basic, I think it's pretty good for the casual or naive user. Basic and Machine Language will be the main action for quite a while yet. Len Lindsay suggests in his commodore Tour article that new implementations of Basic are in the works. Frankly, the Gossip Club is excited.

Q: *Well, Dr. Chip, we've used up most of our time on Commodore rumors. What's happening with the new Atari mchines? Do you see substantial impact from them?*

A: Definitely. I think their current introduction of two fully integrated systems, the 400 and 800, represent a new "milestone" in the microcomputer industry. . . a sign of advancing maturity if you will. They're avoiding some of the mistakes that Commodore went through in the early days by introducing everything at once: not only a computer with tape storage, but disk drives, printer, joysticks, software. . . in short, the whole works. And for the first time in the history of the industry, we're seeing personal computer systems in the Sears and Penney catalogues. This in itself represents a new era in the sale and support of microcomputer systems.

Q: *Do you think these "giant" retailers can sell computer systems effectively?*

A: That's a question yet to be answered. It will depend on the training and support given the retail store personnel. Atari has already demonstrated their ability to sell sophisticated electronic products such as their higher priced home video games in the consumer marketplace.

Q: *What about the machines themselves?*

A: I'm hearing interesting things. The Basic, not Microsoft, has some neat bells and whistles built-in. On the other hand, nobody's perfect. For example, we've heard a recent rumor that the Atari has no home cursor function. I haven't had my hands on one yet so I can't be sure. If you're excited about color, the Atari is said to have approximately 120 different shades of color available! I'll spend more time on the Atari in our next interview.

Thank you, Doctor Chip. We'll look forward to it.

The mailing office at Figment U. is quite small, so letters to Dr. Chip should be addressed to:

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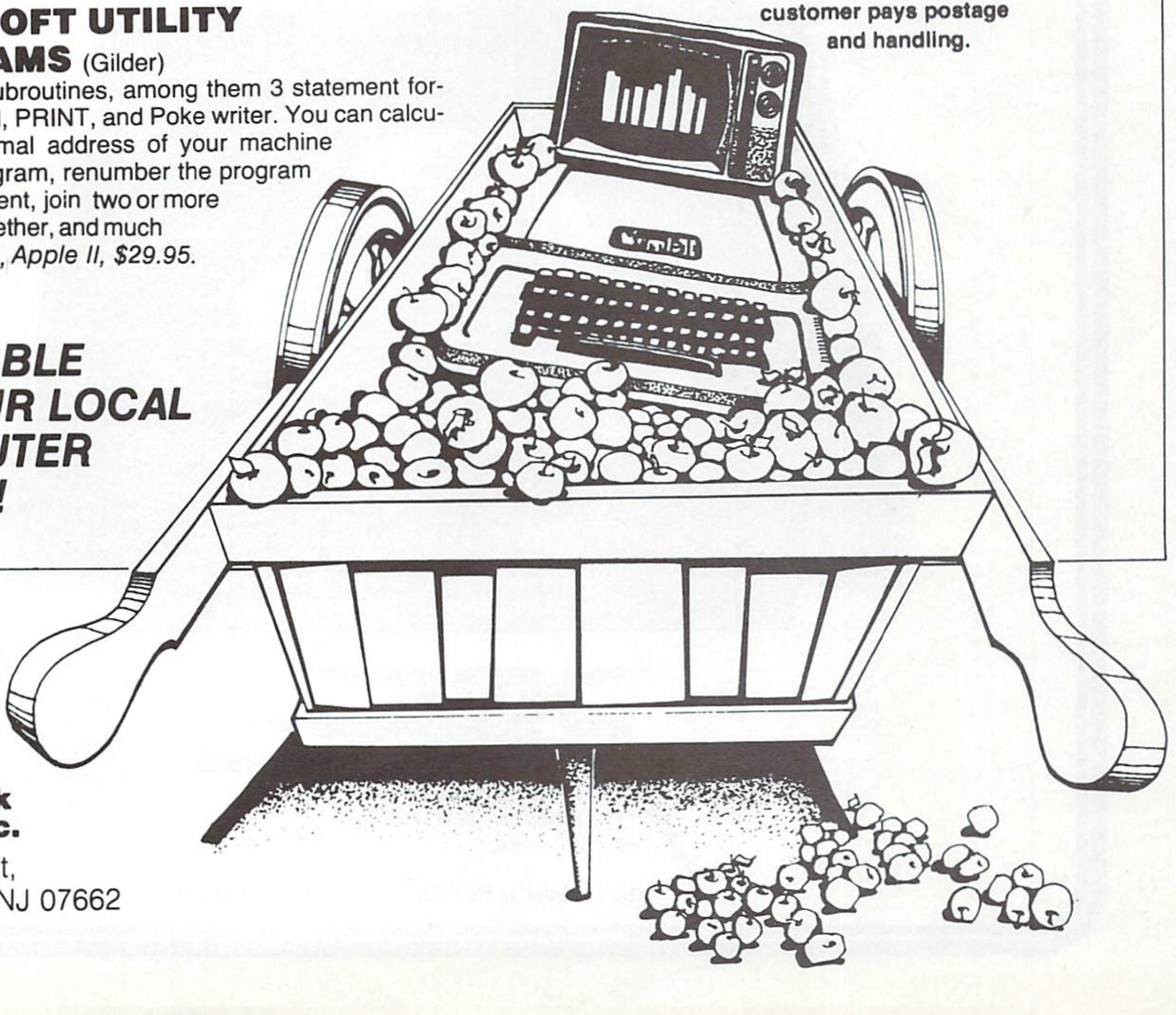

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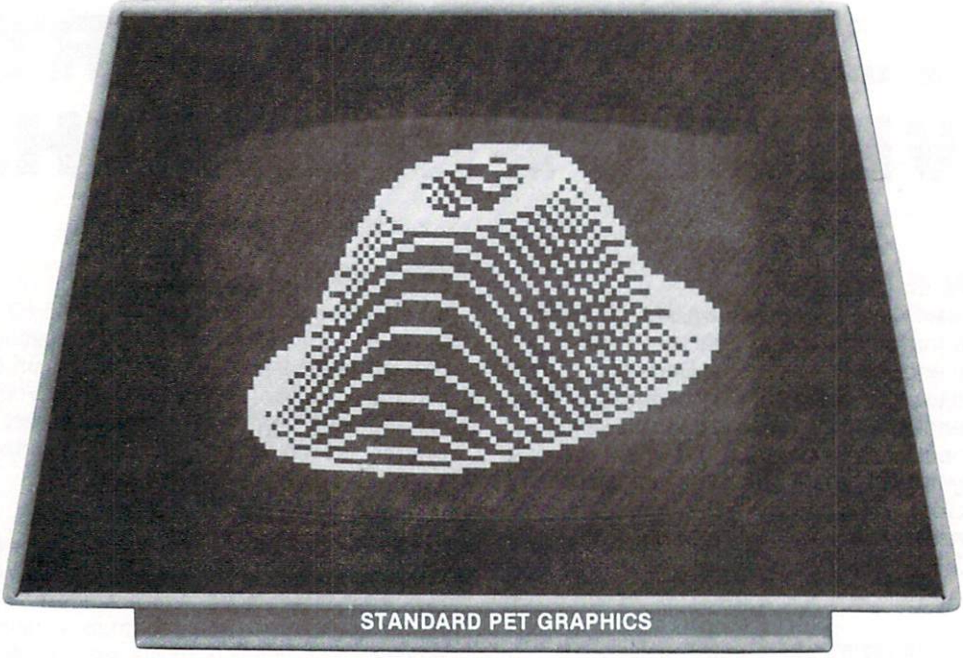

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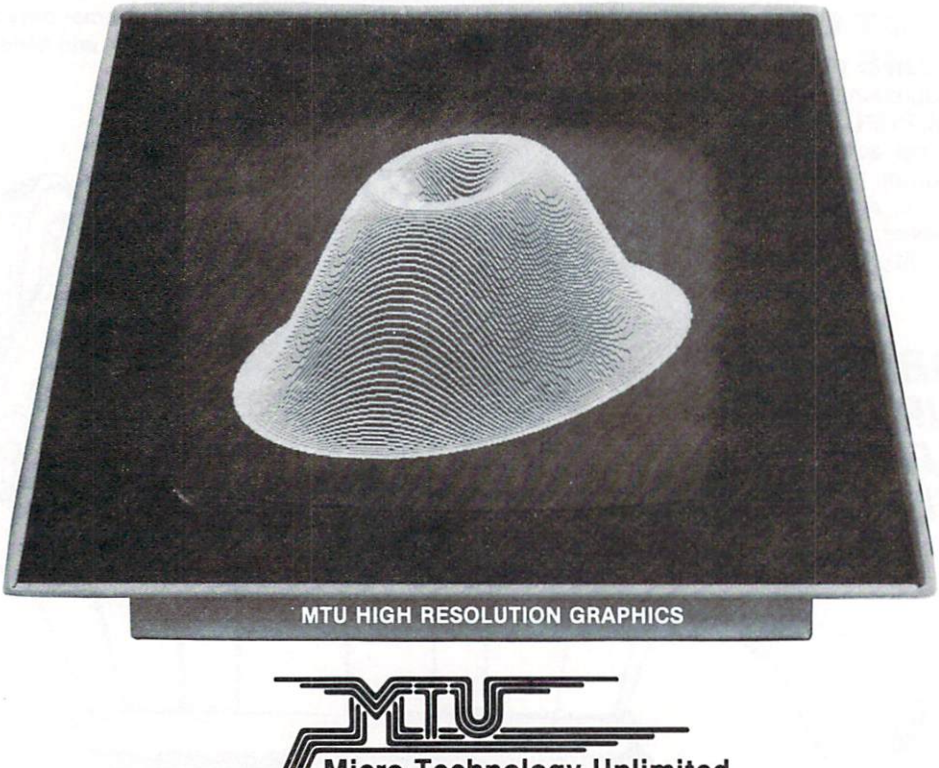

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SORTING SORTS: PART 2

Rick and Belinda Hulon

As mentioned in the first article of this two-part series, the selection of an appropriate sorting algorithm is crucial for many business applications involving microcomputers. While the first article concerned itself with the slow to intermediate sorts (Selection, Bubble and Shell), this article deals with the faster, more sophisticated (and therefore less intuitive) algorithms. At the outset of the writing of this article three "fast" sorts were under consideration: Quick Sort, Heap Sort, and Merge Sort. Initially Merge Sort was thought to be an appropriate sort since it is not only fairly fast but is the one chosen as the "built-in" sorting algorithm for many mainframes. Upon closer examination it was determined that Merge Sort was not a viable algorithm for a micro (at least not the version to which we had access). While the actual programming could be done, the routine would require an immense amount of data storage and numerous array swaps. Since this algorithm was of dubious value for business applications on a micro, we decided to delete it from the article. This article will instead concentrate on the comparison of Heap Sort and Quick Sort as well as relating them to the previously examined sorts. It will also discuss the advantages of a machine code algorithm over its BASIC counterpart and present a hopefully usable machine code version of Heat Sort for your implementation.

Quick Sort is a fairly fast sorting algorithm which achieves its goal by subdividing the original list of data items. This is done by initially placing the first item in the list in its proper place relative to the other items in the list, i.e., all of the items to its "left" are smaller than it is, and all of the items to its "right" are larger. This process continues with the two newly created lists until the entire array is sorted. Quick Sort, though complicated, is a very efficient sort.

Heap Sort is an even more complicated algorithm which involves the use of a "binary tree". The sort is achieved by "traversing" the tree. The larger items are worked up a "branch", one by one, until they reach the top. Each is then placed in its appropriate place at the bottom of the heap and a new value "climbs" the tree. While this algorithm is even less intuitive than Quick Sort, it too is a very speedy algorithm.

It is important to note that while a thorough understanding of these algorithms would be helpful in terms of making modifications, etc., it is not crucial to the implementation of the listings provided as useful tools. The above descriptions are obviously not intended to provide you with a complete understanding of how these routines work. Rather, they are simply meant to give you a general idea of their functioning. There are numerous books on the subject of sorting which would provide you with a better understanding of these algorithms. Since such a discussion would be lengthy, is not the purpose of this article and is not necessary to use the presented routines, we will not engage in a further description of the algorithms.

In the last article, time, number of comparisons, and number of exchanges were used as the basis of comparing the sorting algorithms. Due to the nature of the routines currently being scrutinized, it becomes difficult to define comparisons and exchanges. Certainly the end result would not be something one could compare to the more straightforward comparison and exchange counts of the slower algorithms. For that reason, this article shall concentrate on the less questionable concept of time. Indeed, for most users this will be the most important factor anyway.

For consistency, the data was gathered in the same manner as before: thirty lists of random numbers were generated, sorted and timed. The times were then averaged to give the data reported in Table 1. This process was repeated for lists of size 10, 25, 50, 100, 500.

Upon examining the data in Table 1 it is easy to see that Quick Sort was consistently faster than Heap Sort. Our prediction was that Heat Sort would be the faster sort on larger lists, but it did not hold true. However, one must remember that, unlike the sorts in the last article, there are

List Size	Avg. time for Quick Sort	Avg. time for Heap Sort
10	.99	1.31
25	3.09	4.37
50	7.11	10.69
100	16.21	25.17
500	105.12	169.91

Time in seconds
TABLE 1

numerous versions of Quick Sort and Heap Sort available. Consequently, the results could vary depending on the rendition used. For our particular versions, Quick Sort became increasingly faster than Heap Sort as the list size increased. Looking back at the data collected for the three slower sorts, one can readily verify that Quick Sort and Heap Sort are much more efficient. For lists of size 10, the "fastest" time recorded for the "slow" sorts was 1.1 seconds (Selection Sort). From Table 1 we can see that Quick Sort required .99 seconds and Heap Sort 1.31 seconds to sort 10 items. This is not surprising since Heap Sort is known to be more efficient on larger lists. Indeed, as the list size increases both Heap Sort and Quick Sort out-perform the others. For lists of size 100 Quick Sort required 16.2 seconds and Heap Sort 25.17 seconds; the least time recorded for the slower sorts was 57.2 seconds by Shell Sort. In fact, Selection Sort required 1.8 minutes and Bubble Sort 3.6 minutes to sort 100 items. One might also note that while it took Quick Sort an average of 105.12 seconds to sort 500 items, it was not even feasible to sort 500 items by the slower sorts due to the immense amount of time involved.

It was shown in the last article that, due to the nature of an interpreter (vs. a compiler), BASIC algorithms are much slower than their counterparts in a compiled language (ex. PL/1). Since an interpreter must translate each BASIC statement into machine code every time it is encountered, an algorithm written in machine code should proceed much faster. Indeed, the data presented in the previous article showed that a machine code version of Selection Sort (a "slow" sort) sorted 100 items in 0.17 seconds! Even Quick Sort required as much as 16.2 seconds to sort a list of this size. In fact, Quick Sort required .99 seconds to sort only 10 items. It took Quick Sort almost six times longer to sort 10 items than the machine code version of Selection Sort to sort 100 items. It should be obvious then that a machine code version of even a slow sort would be preferable to a BASIC version of a fast sort. While the BASIC algorithms presented were capable of sorting random numbers of more than one byte, only random numbers between 1 and 100 were used so that each number was only one byte in length. The machine code sort was very specialized in that it would only sort 255 or fewer single byte data items. For this reason no listing is presented. Included, however, is a machine code version of Heap Sort which will sort more than one byte of data. The data provided in Table 2 was obtained by sorting character strings of 10 or fewer characters (bytes). The numbers can not be directly compared to the other sorts since the algorithm does sort larger items of data, but even so one can easily see that it is far superior to the BASIC algorithms.

List Size	Time (secs) for mach. code Heap Sort
10	.09
25	.14
50	.23
100	.45
500	2.67

TABLE 2

HEAPSORT

```
100 L=INT(N/2)+1
120 K=N
140 IF L=1 THEN 220
160 L=L-1
180 S=V(L)
200 GOTO 300
220 S=V(K)
240 V(K)=V(1)
260 K=K-1
280 IF K<1 THEN V(I)=S:GOTO 440
300 J=L
320 I=J
340 J=J+J
360 IF J>K THEN V(I)=S:GOTO 140
380 IF J<K THEN IF V(J)<V(J+1) THEN J=J+1
400 IF S>=V(J) THEN V(I)=S:GOTO 140
420 V(I)=V(J):GOTO 320
440 END
```

QUICK SORT

```
100 TP=1:LOWER(1)=1:UPPER(1)=N
120 IF TP<=0 THEN 480
140 LB=LOWER(TP):UB=UPPER(TP):TP=TP-1
160 IF UB<=LB THEN 120
180 I=LB:J=UB:TEMP=V(I)
200 IF J<1 THEN 260
220 IF TEMP>=V(J) THEN 260
240 J=J-1:GOTO 200
260 IF J<=I THEN V(I)=TEMP:GOTO 400
280 V(I)=V(J):I=I+1
300 IF I>N THEN 360
320 IF V(I)>=TEMP THEN 360
340 I=I+1:GOTO 300
360 IF J>I THEN V(J)=V(I):J=J-1:GOTO 220
380 V(J)=TEMP:I=J
400 TP=TP+1
420 IF I-LB<UB-I THEN LOWER(TP)=I+1:
    UPPER(TP)=UB:UB=I-1:GOTO 160
440 LOWER(TP)=LB:UPPER(TP)=I-1:LB=I+1
460 GOTO 160
480 END
```

The listing provided of the machine code version of Heap Sort is actually a BASIC program containing the sorting routine in DATA statements. Lines 110-190 of the program poke the algorithm into memory beginning at hex location $1600. Please note that this routine is not relocatable, therefore it will not be possible to alter its starting position. The BASIC program as listed is very similar to the one we used to gather the data

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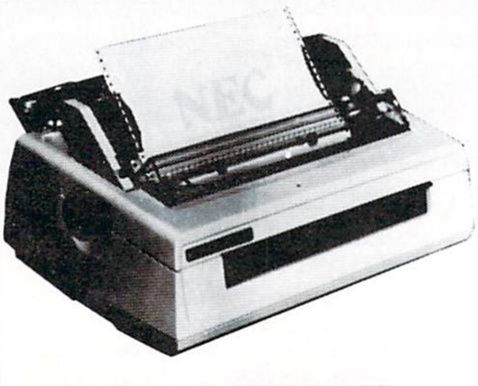

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that appears in Table 2 in that it generates N random character strings with length varying from one to ten bytes and sorts those items. We suggest that if you intend to use this sorting algorithm you first copy the given listing verbatim. In that way you will very easily be able to determine if indeed you have copied the entire list of data statements properly by simply running the program. Be sure, however, to save the program before you attempt to execute it, for if any data statements were copied incorrectly you could easily lose control of the execution and be forced to implement a cold start. Once you are sure the algorithm is functioning correctly, you may proceed to modify the program to suit your particular need.

As an example of how you might use this algorithm, suppose you have 100 character strings stored on tape that you wish to have sorted and printed on the screen. You could accomplish this task by making the following additions and substitutions:

```
90 OPEN 1,1,0,filename
350 INPUT#1,A$
360 L = LEN(A$)
420 X$ = MID$(A$,J,1) :PRINT X$;
440 POKE BD + P +J,ASC(X$)
```

After keying in the above lines, it is simply necessary to run the program and respond to the list size prompt with "100". As another example, suppose the situation were the same as the above, but instead of character strings, the tape file contained monetary amounts in the range $0.00 to about $65,000.00. The following changes should be made.

```
90 OPEN 1,1,0,filename
350 INPUT#1,A:PRINT A
360 L = 3
400 A2 = INT(A)
410 Q = INT(A2/256)
420 R1 = A2-Q*256
430 R2 = INT( (A-A2) *100 + 100 +   .5)
440 POKE BD + P + 1,Q
450 POKE BD + P + 2,R1
460 POKE BD + P + 3,R2
500
800 A = 256*PEEK(Y + 1)  +   PEEK(Y + 2)
820 A = A + (PEEK(Y + 3)/100)
840 PRINT A
860
880
```

In total, on a 32K machine, this algorithm is equipped to handle approximately 5000 bytes of data. It will function on 8K, 16K, and 32K Commodore CBMs and PETs, but of course the amount of data that can be used will depend on the amount of RAM available.

This two-part series of articles, then, has concerned itself with the selection of an appropriate sorting algorithm. Listings of slow, fast, simple and complex sorts have been provided and at least partially explained. It has been pointed out that such criteria as the time involved and the amount of knowledge and actual programming required must always be of concern to the user when choosing a sorting routine. Depending upon the type of application needed and the expertise of the user, any of the BASIC algorithms or the machine code sort that we have presented could be implemented. Microcomputers can be of vast benefit to the small business, but only if used properly and wisely. The selection of an appropriate sorting algorithm is an important part of using your micro wisely.

```
HEAP SORT IN MACHINE CODE
100 PRINT"               ONE";
105 PRINT" MOMENT, PLEASE.
110 BS=5632:BA=6402
120 FOR I=BS TO BS+1000
140 READ A
160 IF A=500 THEN 240
180 POKE I,A
190 NEXT I
240 P=0:C=0:PRINT"
260 INPUT"HOW MANY ITEMS";N
265 PRINT"               THE ORIGINAL LIST
270 BD=BA+2*N+10
280 FOR I=1 TO N
290 PRINTI" ";
300 Q=INT((BD+P)/256)
320 R=(BD+P)-Q*256
340 POKE BA+C,R:POKE BA+C+1,Q
360 L=INT(10*RND(1))+1
380 POKE BD+P,L
400 FOR J=1 TO L
420 X=INT(26*RND(1))+65:PRINTCHR$(X);
440 POKE BD+P+J,X
460 NEXT J
480 P=P+L+1:C=C+2
500 PRINT
520 NEXT I
540 T1=TI
560 Q=INT(N/256)
580 R=N-Q*256
600 POKE 6168,R:POKE 6169,Q
620 L=INT(N/2)+1
640 Q=INT(L/256)
660 R=L-Q*256
680 POKE 6170,R:POKE 6171,Q
700 SYS 05632
720 T2=(TI-T1)/60
740 PRINT"                THE SORTED LIST
760 FOR I=0 TO N-1
770 PRINTI+1" ";
780 Y=PEEK(BA+2*I)+256*PEEK(BA+2*I+1)
800 L=PEEK(Y)
820 FOR J=1 TO L
840 PRINTCHR$(PEEK(Y+J));
860 NEXT J
880 PRINT
900 NEXT I
920 PRINT""T2" SECS
930 PRINT" HIT ANY KEY TO CONTINUE
940 GET T$:IF T$="" THEN 940
960 GOTO 240
```

```
1000 DATA 173,27,24,208,104,173,26,24
1010 DATA 201,1,208,97,173,24,24,24
1020 DATA 42,133,178,173,25,24,42,105
1030 DATA 25,133,179,234,234,160,0,177
1040 DATA 178,141,32,24,200,177,178,141
1050 DATA 33,24,173,3,25,145,178,136
1060 DATA 173,2,25,145,178,56,173,24
1070 DATA 24,233,1,141,24,24,173,25
1080 DATA 24,233,0,141,25,24,201,0
1090 DATA 208,80,173,24,24,208,75,173
1100 DATA 28,24,24,42,133,178,173,29
1110 DATA 24,42,105,25,133,179,234,173
1120 DATA 32,24,160,0,145,178,200,173
1130 DATA 33,24,145,178,96,56,173,26
1140 DATA 24,233,1,141,26,24,173,27
1150 DATA 24,233,0,141,27,24,173,26
1160 DATA 24,24,42,133,178,173,27,24
1170 DATA 42,105,25,133,179,160,0,177
1180 DATA 178,141,32,24,200,177,178,141
1190 DATA 33,24,173,26,24,141,30,24
1200 DATA 173,27,24,141,31,24,173,30
1210 DATA 24,141,28,24,173,31,24,141
1220 DATA 29,24,24,46,30,24,46,31
1230 DATA 24,173,31,24,205,25,24,240
1240 DATA 5,144,16,76,86,23,173,30
1250 DATA 24,205,24,24,144,5,240,89
1260 DATA 76,86,23,173,30,24,24,42
1270 DATA 133,178,173,31,24,42,105,25
1280 DATA 133,179,234,234,160,0,177,178
1290 DATA 133,180,200,177,178,133,181,24
1300 DATA 165,178,105,2,133,178,165,179
1310 DATA 105,0,133,179,160,1,177,178
1320 DATA 72,136,177,178,72,165,181,72
1330 DATA 165,180,72,32,167,23,104,133
1340 DATA 178,104,197,178,144,19,240,17
1350 DATA 24,173,30,24,105,1,141,30
1360 DATA 24,173,31,24,105,0,141,31
1370 DATA 24,173,30,24,24,42,133,178
1380 DATA 173,31,24,42,105,25,133,179
1390 DATA 160,1,177,178,72,136,177,178
1400 DATA 72,173,33,24,72,173,32,24
1410 DATA 72,32,167,23,104,133,178,104
1420 DATA 197,178,240,2,176,33,173,28
1430 DATA 24,24,42,133,178,173,29,24
1440 DATA 42,105,25,133,179,234,234,160
1450 DATA 0,173,32,24,145,178,200,173
1460 DATA 33,24,145,178,76,0,22,173
1470 DATA 28,24,24,42,133,180,173,29
1480 DATA 24,42,105,25,133,181,234,234
1490 DATA 173,30,24,24,42,133,178,173
1500 DATA 31,24,42,105,25,133,179,234
1510 DATA 234,160,0,177,178,145,180,200
1520 DATA 177,178,145,180,76,166,22,104
1530 DATA 141,34,24,104,141,35,24,104
1540 DATA 133,178,104,133,179,104,133,180
1550 DATA 104,133,181,160,0,177,178,209
1560 DATA 180,240,9,176,14,133,182,162
1570 DATA 1,24,144,13,133,182,162,0
1580 DATA 24,144,6,177,180,133,182,162
1590 DATA 2,160,1,177,178,209,180,208
1600 DATA 38,200,196,182,144,245,240,243
1610 DATA 224,1,240,9,16,16,169,0
1620 DATA 72,72,76,15,24,177,180,72
1630 DATA 169,0,72,76,15,24,169,0
1640 DATA 72,177,178,72,76,15,24,133
1650 DATA 178,177,180,72,165,178,72,173
1660 DATA 35,24,72,173,34,24,72,96
1670 DATA 500
```

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Harvey B. Herman
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A 6502 microprocessor can address a total of 65K bytes of memory (RAM plus ROM). The address space for BASIC programs (RAM) is necessarily restricted to less than that without resorting to hardware tricks. However, most BASIC programs do not take up anywhere near the maximum amount of reserved memory (32K bytes for the PET). Occasionally it would be useful to have several short noninteracting BASIC programs in memory at the same time. For example, we use short programs to check student laboratory calculations (J. Chem. Ed., Vol. 55, p. 654 (1978)). When multiple laboratories are in process it would be simpler to LOAD a tape containing a number of programs and have each student run the program appropriate for his experiment.

One way to combine programs is to renumber and merge individual programs with a subsequent re-save of the combination. There are several disadvantages to this approach. It is important to keep line numbers separate in each program to be merged else you may not be able to delete or LIST parts of the program (unnerving at first). An ordinary LIST of the program will show frequently unrelated parts as one program (not esthetically pleasing). The student user must remember to RUN with a line number specified for his chosen segment (or risk being hopelessly confused. Finally this approach will not allow placing utility programs (written in BASIC) in reserved areas of memory unless they are merged with every program (a formidable task).

Since I frequently use a number of short programs and have unused memory I thought it would be helpful to partition the BASIC workspace for storage of individual programs. For example, an 8K PET (7167 bytes free) could have three 2K partitions under control of a 1K master program. It is possible to make other configurations as long as the total does not overrun the free memory available. If the partitioning is done properly the stored programs would not interact with each other. Each program would "think" it was in a 2K PET. (I actually owned a 2K PET once when I had a memory failure.) The master program would be in charge of adjusting the necessary pointers so a given program could be accessed when requested by the user.

Microsoft BASIC (for the PET and other microcomputers) uses pointers to subdivide free memory. The table summarizes important pointers (at least for this discussion) for both old and new PETs. The following material is for the old ROMs. It is not necessary to do any hex arithmetic to use the method I will describe. However, it does help to understand a little about pointers. If BASIC program text is stored beginning at location hex 401 (it is assumed location hex 400 contains a zero) the pointers to start of text (location 122/123) would read 1 and 4 for low and high byte respectively. That example was not too difficult but it must be remembered that the value returned is in decimal. If start of text was changed to, say hex 1001, location 123 would now read 16 corresponding to the decimal representation of the most significant half of that number (hex 10). To activate a new partition it is only necessary to set pointers to start of BASIC text (122/123), end of BASIC text (124/125) and top of memory (134/135). Subsequently executing CLR will set all the other pointers automatically (e.g., bottom of strings, etc.) and after END we find ourself in the new partition.

As an exercise I wrote a short master program (1K workspace) controlling three short donothing BASIC programs (each in a 2K workspace). They are shown in the figure. The master program asks the user for a program number and automatically sets the pointers to activate that program. At this point the user is in a 2K workspace with one program active which can be RUN or modified as desired. The last statement in each of the short programs returns the user to the master program. Each program is completely independent of the others, snug and protected in its own private world.

Setting up the example or one like it is not difficult. Each program could be typed in after the partition is activated by the master program (NEW first). Keep track of the size of each program by PEEKing at locations 124 and 125. This information should be stored in the master program so one can enter and leave the partition without destroying the BASIC text (c.f., line 210 in master program). The size of the master program should also be recorded and restored before returning to it (c.f., line 40 in program 1).

Relatively long programs are a nuisance to type into each partition. If the program is on cassette tape it can be relocated to any partition using the procedure described in my article "MOVE IT" (MICRO 16:17 and 17:18). Normally tapes load starting at hex 400. By reading in the tape header first and changing the load parameters in the tape buffer information on cassette tape can be stored elsewhere in memory. Keep two points in mind. One, before using the relocated programs for the

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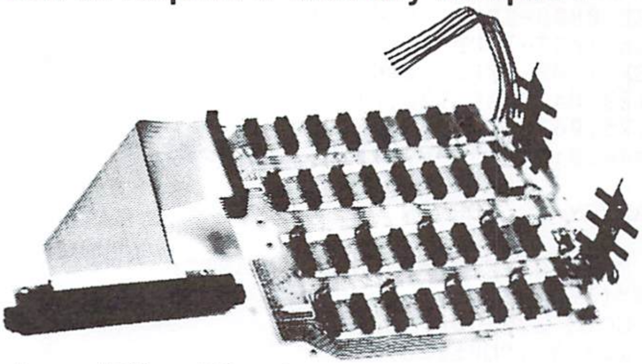

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first time the BASIC line links (see p. A-9 in PET User Manual) must be corrected. The easiest way to do this is to type any line number *not* in the program and return. Two, record the length of the program by PEEKing at locations 124 and 125 after an *ordinary* tape load. In my example program 1 showed 4 and 74 respectively. Since I intended to relocate the program to a partition beginning at hex 800, it was necessary to use the values 8 and 74 in line 210 in the master program.

The partition idea described above should be applicable, with only minor changes, to any microcomputer using Microsoft BASIC. In fact I used a partition for the first time on my SYM to store an initialization program which was used infrequently. In this case the partitions were of unequal length, 4K and 8K. Readers might be interested in storing their short BASIC utility programs in an out of the way partition and activate the programs when necessary as I did with the SYM initialization program. Maybe others could share their ideas on the subject with me care of this magazine. We could publish the best ones in a future article. (Anyone for time sharing?)

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Start of Text	122/123	40/41
End of Text	124/125	42/43
Top of Memory	134/135	52/53

```
10 REM MEMORY PARTITION-MASTER PROGRAM
20 REM  EXAMPLE:
30 REM THREE PROGRAM WORKSPACES
35 REM CREATED AT:
40 REM HEX 0800-0FFF  PROGRAM 1
50 REM HEX 1000-17FF  PROGRAM 2
60 REM HEX 1800-1FFF  PROGRAM 3
65 POKE 123,04:POKE 122,01
66 POKE 125,06:POKE124,57:CLR
67 POKE2048,0:POKE4096,0:POKE6144,0
70 :
80 REM HARVEY B. HERMAN
90 :
95 PRINT "WHICH PROGRAM DO YOU WANT";
100 INPUT"(1-3)";N
110 ON N GOTO 200,300,400
200 POKE 123,08:POKE122,01
205 POKE135,24:POKE134,0
210 POKE 125,08:POKE 124,74:CLR:END
300 POKE 123,16:POKE122,01
305 POKE135,24:POKE134,0
310 POKE 125,16:POKE 124,74:CLR:END
400 POKE 123,24:POKE122,01
405 POKE135,32:POKE134,0
410 POKE 125,24:POKE 124,74:CLR:END
```

```
10 REM PROGRAM 1
20 A=1
30 PRINT A
40 POKE123,4
45 POKE124,57
50 POKE125,06
55 POKE135,8
60 CLR:END
```

```
10 REM PROGRAM 2
20 B=2
30 PRINT B
40 POKE123,4
45 POKE124,57
50 POKE125,06
55 POKE135,8
60 CLR:END
```

```
10 REM PROGRAM 3
20 C=3
30 PRINT C
40 POKE123,4
45 POKE124,57
50 POKE125,06
55 POKE135,8
60 CLR:END
```

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Editor's Note: We're happy to welcome Bob Baker to the pages of COMPUTE. Bob is the new author of Kilobaud Microcomputing's PET-Pourri Column. He replaced Len Lindsay who's quite busy these days with various writing tasks.

AN EASIER METHOD OF SAVING DATA PLUS
HomeAccounting

Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004

Whenever a program must save specific data for the next time it is run, the data is normally saved in a tape data file. This requires inserting a tape with the data file and reading the previous values every time the program is run. When the program is done, the tape must be rewound or changed and another data file written to save the new data. This procedure can waste a good deal of time, especially if only a small amount of data is needed and the program is normally run quite frequently. It can take as long as 10 to 15 seconds on the PET just to find the data file and read the header record before actually reading any data. In addition, you now have a tape for the program and another tape for the data file. If you only have several values to save, using data files is awkward, cumbersome, and not worth the trouble. Several applications that could be done very easily on a computer, in reality become useless when requiring data files.

Another possible method of saving data is to change the BASIC pointers and save the data along with the program on tape. The next time the program is loaded, the BASIC pointers are then reset and a GOTO xxxxx command is used to execute the program. If a RUN command is used instead of a GOTO, the data is lost and the program must be re-loaded. This method is too complicated and requires a number of functions the user must perform each time they save or load the program and data. It also runs the risk of permanently losing the data.

There is a way, however, that a program can save small amounts of data within the program itself using a very simple procedure. The basic theory is to include DATA statements in the program with initial data specified for the first time the program is run. The DATA statements and their associated data define space within the program for the data that is to be saved after each time the program is run. Before terminating, the program simply POKE's the new values to be saved back into the DATA statement(s) to replace the original data. The program itself is then saved after each execution and the latest data is automatically included without any special actions by the user. Whenever the program is loaded, the previous data is readily available using the standard READ command of BASIC. Saving data using this method is extremely simple, but it does require knowing the format of BASIC lines stored in memory. The necessary information on the PET has been described in various newsletters and several magazine articles, so it will not be repeated here. This article was written for the PET primarily, but the technique will work for other machines as well.

The listing for a Home Budget program that I've been using for several months on my 8K PET is included to help illustrate this simple data saving technique. Looking at the start of the program, lines 10 and 20 contain DATA statements to reserve space for 12 numeric values to be saved after each time the program is run. The DATA statements are located at the very beginning of the program, making it easier to know where to do the POKE's. Each value saved can be up to 6 digits in length, since this is the length of each field specified in the original DATA statements. Disregarding how the program actually works for now, the data from lines 10 and 20 would normally be read into elements of array "M" by lines 510 and 520. When the program is done, the value of a single element of M or M(x) is converted to a 6 character string with leading zeros blanked as spaces in line 1010. This insures that all 6 characters of each field in the data statements are changed every time the new data is saved in the program. The ASCII value of each character in the string representation of M(x) is then poked into a DATA statement by line 1030. This loop is repeated for all 12 values and a reminder is then printed so the user will not forget to save the program with the updated data. The program could have even printed the actual SAVE command for the user if desired. I intentionally left this out, however, in case the user decided the new data was not correct and wanted to re-run the program without saving the updated values.

If you should use this technique in your own program, don't forget it can be used to save strings or numbers. Be careful you don't destroy the DATA statement itself or the separating commas when poking characters into a DATA statement. Also, don't forget to step over the end-of-line flag, the 2-byte link, the 2-byte line number, and the 1-byte DATA statement "token" when more than one line is used to save data in the program. Each field definition should reserve enough space for the maximum length expected to be encountered by the program. Numeric values must be converted to strings before being saved. Quotes should be used at the beginning and end of each field when saving text strings. Don't forget to step past the quotes when poking the strings into the data statements. Strings should be changed to the length of the field being poked into by appending spaces as was done in the example with the numeric values after converting them to text strings. This will insure the entire field is updated each time the program is run and the correct data is always saved. The DATA statements must remain at a constant location in memory. Being at the beginning of the program avoids problems with changing locations caused by editing the program before the DATA statements. If the DATA statements are moved, the address used for the POKEs must be changed accordingly.

Home Accounting

I don't claim to be an accounting expert but the Home Budget program works and serves a very useful purpose for me. It is based on an original budget system I devised that used an accounting book to record all income and expenditures. Various ''accounts''within the budget help allocate what money from each paycheck is to be reserved for which bills in order to meet the projected expenses. Accounts for bills that are paid at least once a month are kept in the family checking account where they are readily available. Accounts for all other bills, paid at longer intervals, are normally kept in the savings account until needed. An account is established for each major expenditure, such as: insurances, home mortgage, utilities, telephone, auto loan, auto expenses, charge accounts, Christmas presents, vacation, etc. All smaller expenses are grouped into a miscellaneous account that is kept in the checking account. An additional account is reserved in the savings account for all ''excess'' funds, as the true ''savings'' total.

This simple BASIC program provides all the desired functions to keep an accurate home budget with a minimum of effort. It does not have any fancy features, instead it provides the necessary information in an easy to use format. It displays each account total along with the current checking and savings balances for fast and easy verification. Each transaction is entered by selecting the appropriate account number and the value to credit (+) or debit(-) the specified account. Positive values indicate deposits (credit) and negative values indicate expenses or bills paid (debit). The actual transactions are not recorded, only the running totals for each account are retained to keep the amount of saved data at a minimum. An additional feature of this program is the ability to set the amount to be credited to each account for a paycheck deposit. Thus, come payday, you simply enter the amounts deposited to the checking and savings account and the program does the rest. An account total can become negative if expenses exceed current funds allocated for that expense. This effectively indicates ''borrowing'' money from other accounts and should be corrected by transferring money from another account or changing the pay deposit value for the account. A negative checking or savings balance should be avoided as this indicates a very serious problem such as an overdrawn checking account. The first step in setting up the budget is to decide what accounts are needed and how many will be in checking or savings. In line 500 of the program, the variable ''C'' is defined as the number of budget accounts in checking (7), and ''S'' is defined as the number of accounts in savings (5). The variable ''A'' is computed as the total number of budget accounts (C + S = 12), and the money (M) and name (N$) arrays are dimensioned in the same line.

Since we are going to save the data within the program, we must define storage for the values in data statements. Line 10 contains the initial values for the checking accounts and line 20 is for the savings accounts. Separate DATA statements were used for checking and savings to allow easy addition or deletion of accounts as required. All values will be kept as whole numbers by multiplying each value by 100. This will help avoid decimal points and problems associated with fractions, besides making the data easier to save using pokes. With 6 digits per field, the limiting values for any account value are: -999.99 to +9999.99 since the minus sign takes up one digit space for negative numbers.

The actual account names are stored in lines 100-210. Lines 100 and 110 are for the checking accounts while lines 200 and 210 define the savings account names. Each name should be limited to 28 chracters for the program to function properly. In addition, the last checking account must be the MISC account and the last savings account must be the excess SAVINGS account. The amount to be deposited from a pay to each checking account is specified in line 300 with a zero value shown for the MISC account, the last value. This account automatically gets any remainder from the pay deposit after all the required checking account deposits are made. If the pay deposit is not large enough to meet the required checking budget total, the difference is subtracted from the MISC account. Line 400 contains the corresponding savings pay deposit values, with a zero value for the excess SAVINGS account, the last value. This account acts just as the MISC account does for the checking account. Any savings pay deposit excess/shortage is added/subtracted to this account.

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To customize the program for your own use, simply set the correct values of C and S in line 500. Then add or delete the required DATA fields in lines 10 and 20, and the account names in lines 100-210. Change any account names as required but keep each to a maximum of 28 characters. Set the PAY deposit values for each account in lines 300 and 400 by taking into consideration the related expenses and frequency of payment. Remember to keep the MISC and SAVINGS accounts as the last accounts in the checking and savings, with zero pay deposit values for each. That should be all the changes required to convert the program for your own situation. Individual accounts can be added or deleted at any time by similar changes. Don't forget to set an account value to zero by transferring any money to other accounts before deleting the account. This will keep your checking and savings balances correct.

The program listing contains a number of REM lines to help document the program. If you should decide to use the example program, please don't bother entering these lines. They'll only make the program loading and saving much longer, since the program will be about 3 times larger than needed. This is exactly what was tried to avoid by saving the data within the program to minimize tape useage. Once typed in, a few minutes experimenting with the program should clearly indicate how it works. Enter a few transactions, then type D and list lines 10 and 20 to see what was saved within the program. If you have any problems, check for extra spaces in lines 10 and 20 or check the POKE address in line 1010.

```
10 DATA000000,000000,000000,000000,000000,
      000000,000000
20 DATA000000,000000,000000,000000,000000
30 :
31 REM *******************************
32 REM *    HOME BUDGET PROGRAM     *
33 REM *-----------------------------*
34 REM *    BY: ROBERT W. BAKER      *
35 REM *        15 WINDSOR DRIVE     *
36 REM *        ATCO, NJ 08004       *
39 REM *******************************
50 :
51 REM ===============================
52 REM DATA STATEMENTS TO SAVE VALUES
53 REM MUST BE THE FIRST STATEMENTS
54 REM IN THE PROGRAM TO MAKE THEM
55 REM EASY TO FIND.
56 REM ACCOUNT DESCRIPTIONS FOLLOW -
57 REM ===============================
58 :
100 DATA "CHARGES"
102 DATA "GAS & AUTO EXPENSES"
105 DATA "MORTGAGE"
110 DATA "TELEPHONE", "UTILITIES"
115 DATA "AUTO LOAN","MISC"
200 DATA "AUTO INSURANCE"
205 DATA "HOMEOWNERS INSURANCE"
210 DATA "LIFE INSURANCE", "CHRISTMAS"
215 DATA "SAVINGS"
250 :
251 REM ==============================
252 REM FOLLOWING DATA STATEMENT
253 REM CONTAINS STANDARD DEPOSIT
254 REM VALUES FOR PAY DEPOSIT.
255 REM ==============================
256 :
300 DATA 25,40,150,10,50,45,0
400 DATA 30,7,25,15,0
450 :
451 REM ==============================
452 REM MAJOR VARIABLE DEFINITIONS:
453 REM  C  = # OF ITEMS IN CHECKING
454 REM  S  = # OF ITEMS IN SAVINGS
455 REM  A  = TOTAL NUMBER OF 'ACCTS'
456 REM  CB = CHECKING BALANCE
457 REM  SD = TOTAL SAVINGS DEPOSIT
458 REM  M(.)  = CURRENT ACCT VALUES
459 REM  N$(.) = ACCT NAMES FROM DATA
470 REM ==============================
471 REM READ VALUES FROM DATA
472 REM STATEMENTS TO INITIALIZE.
479 REM ==============================
480 :
500 C=7:S=5:A=C+S:DIM M(A),N$(A)
505 CB=0:SD=0
510 FOR X=1 TO C:READ M(X):CB=CB+M(X)
515 NEXT
520 FOR X=C+1 TO A:READ M(X)
525 SD=SD+M(X):NEXT
540 FOR X=1 TO A:READ N$(X):NEXT
550 L$="........................... $"
590 :
591 REM =============================
592 REM DISPLAY ACCT #, NAME, & VALUE
593 REM ALONG WITH CHECKING/SAVINGS
594 REM TOTALS, THEN PROMPT FOR INPUT
595 REM =============================
596 :
600 PRINT"[CLR]";:C2=0:S2=0
605 FOR X=1 TO C:V=M(X):GOSUB 900:NEXT
606 PRINT TAB(30)"["DDDDDDDDD"]"
610 PRINT"   [RV]TOTAL CHECKING ";
611 PRINT"BALANCE[RVOFF]..... $";
615 V=CB:GOSUB 910:PRINT
620 FOR X=C+1 TO A:V=M(X):GOSUB 900
625 NEXT: PRINT TAB(30)"["DDDDDDDDD"]"
630 PRINT"   [RV]TOTAL SAVINGS ";
631 PRINT"ON DEPOSIT[RVOFF]... $";
635 V=SD: GOSUB 910
636 FOR X=1 TO 39
637 PRINT"["$",LC,DN,"E",UP]";:NEXT
640 PRINT:PRINT"[DN]^"
641 :
642 REM =============================
643 REM GET USER INPUT & CHECK FOR
644 REM VALID INPUT -
645 REM =============================
646 :
650 PRINT"["-@@"] ACCT#, [RV]P[RVOFF]";
651 INPUT"AY, OR, [RV]D[RVOFF]ONE";A$
660 X=VAL(A$):IF X>0 AND X<=A THEN 800
```

```
664 :
665 REM ==============================
666 REM ******   CREDIT PAY   ********
667 REM ==============================
668 :
670 IFLEFT$(A$,1)<>"P"OR(C1<>0)THEN1000
671 :
672 REM =============================
673 REM GET CHECKING/SAVINGS DEPOSITS
674 REM TO CREDIT STANDARD PAY.
675 REM CAN ONLY USE ONCE PER RUN!
676 REM =============================
677 :
680 INPUT"   CHECKING DEPOSIT";C1
681 INPUT"   SAVINGS  DEPOSIT";S1
685 C1=INT(100*(C1+.001))
686 S1=INT(100*(S1+.001))
690 FOR X=1 TO A:READ V:V=V*100
695 IF X=C THEN V=C1-C2
700 IF X=A THEN V=S1-S2
710 GOSUB 950:NEXT:GOTO 600
750 :
751 REM ==============================
752 REM *****  CREDIT/DEBIT ACCT *****
753 REM ==============================
754 :
800 PRINT"[DN]AMT TO CREDIT(+)";
805 INPUT" / DEBIT(-)";V
850 V=INT(100*(V+.001)):GOSUB 950
855 GOTO600
890 :
891 REM =============================
892 REM SUBROUTINE TO GENERATE SINGLE
893 REM LINE OF DISPLAY WITH -
894 REM ACCT #, NAME, AND VALUE IN
895 REM STANDARD FORMAT.
896 REM =============================
897 :
900 PRINT RIGHT$(STR$(X+100),2);" ";
901 PRINTN$(X);RIGHT$(L$,29-LEN(N$(X)));
905 T$=STR$(INT(ABS(V)/100)*SGN(V))
910 PRINT RIGHT$("    "+T$,4);
915 IFV<0ANDV>-100THENPRINT"[2 LC]-0";
920 PRINT".";RIGHT$(STR$(ABS(V)+100),2)
925 RETURN
940 :
941 REM ==============================
942 REM SUBROUTINE TO CREDIT/DEBIT
943 REM ACCT & UPDATE SAVINGS/CHECKING
944 REM TOTALS.
945 REM ==============================
946 :
950 M(X)=M(X)+V
955 IF X>C THEN SD=SD+V:S2=S2+V:RETURN
960 CB=CB+V:C2=C2+V:RETURN
990 :
991 REM ==============================
992 REM ******   CHECK IF DONE   *****
993 REM ==============================
994 :
1000 IF LEFT$(A$,1) <> "D" THEN 600
1001 :
1002 REM =============================
1003 REM AT END OF PROGRAM SAVE DATA
1004 REM BACK INTO THE PROGRAM, THEN
1005 REM PRINT REMINDER TO SAVE PGM
1006 REM =============================
1007 :
1010 N=1030:FOR X=1 TO A
1015 L$=RIGHT$("      "+STR$(M(X)),6)
1030 FOR Y=1 TO 6
1035 POKE N,ASC(MID$(L$,Y,1)):N=N+1
1040 NEXT:N=N+1:IF X=C THEN N=N+5
2000 NEXT
2005 PRINT"[CLR]REWIND TAPE AND SAVE "
2006 PRINT"THE PROGRAM"
2010 PRINT"[DN]TO RETAIN THE NEW DATA!"
2011 PRINT"[2 DN]"
2015 END
2020 REM
2030 REM CURSOR POSITIONING AND GRAPHICS
2040 REM CHARACTERS ARE ENCLOSED WITHIN
2050 REM BRACKETS. THE GRAPHIC CHARS.
2060 REM ARE SHOWN AS UNSHIFTED CHARS.
2070 REM BETWEEN QUOTES. THE CURSOR
2080 REM CONTROL CHARACTERS ARE
2090 REM INDICATED AS FOLLOWS:
2100 REM SP=SPACE; LC=LEFT CURSOR
2110 REM UP=UP CURSOR; DN=DOWN CURSOR
2120 REM CLR=CLEAR SCREEN; RV=REVERSE
2130 REM RVOFF=REVERSE OFF
```

©

PET Word Processor

8K and 16/32K PET versions

CmC
SOFTWARE
Word Processor Program
CONNECTICUT microCOMPUTER

This program permits composing and printing letters, flyers, advertisements, manuscripts, etc., using the COMMODORE PET and a printer.

Printing directives include line length, line spacing, left margin, centering and skip. Edit commands allow you to insert lines, delete lines, move lines and paragraphs, change strings, save files onto and load files from cassette (can be modified for disk), move up, move down, print and type.

Added features for the 16/32K version include string search for editing, keyboard entry during printing for letter salutations, justification, multiple printing and more.

A thirty page instruction manual is included.

The CmC Word Processor Program for the 8K PET is $29.50. The 16/32K version is $39.50.

Order direct or contact your local computer store.

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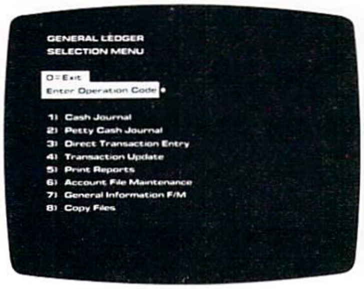
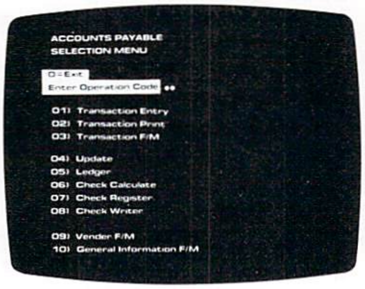


```
GENERAL LEDGER
SELECTION MENU

0=Exit
Enter Operation Code •

1) Cash Journal
2) Petty Cash Journal
3) Direct Transaction Entry
4) Transaction Update
5) Print Reports
6) Account File Maintenance
7) General Information F/M
8) Copy Files
```



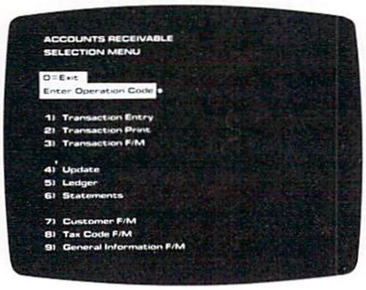
```
ACCOUNTS PAYABLE
SELECTION MENU

0=Exit
Enter Operation Code ••

01) Transaction Entry
02) Transaction Print
03) Transaction F/M

04) Update
05) Ledger
06) Check Calculate
07) Check Register
08) Check Writer

09) Vender F/M
10) General Information F/M
```



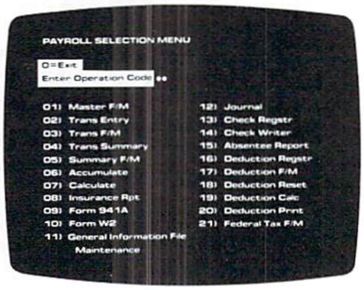
```
ACCOUNTS RECEIVABLE
SELECTION MENU

0=Exit
Enter Operation Code •

1) Transaction Entry
2) Transaction Print
3) Transaction F/M

4) Update
5) Ledger
6) Statements

7) Customer F/M
8) Tax Code F/M
9) General Information F/M
```



```
PAYROLL SELECTION MENU

0=Exit
Enter Operation Code ••

01) Master F/M                      12) Journal
02) Trans Entry                     13) Check Regstr
03) Trans F/M                       14) Check Writer
04) Trans Summary                   15) Absentee Report
05) Summary F/M                     16) Deduction Regstr
06) Accumulate                      17) Deduction F/M
07) Calculate                       18) Deduction Reset
08) Insurance Rpt                   19) Deduction Calc
09) Form 941A                       20) Deduction Print
10) Form W2                         21) Federal Tax F/M
11) General Information File
      Maintenance
```

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- Accepts Up To 3000 Transactions Per Month.
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- Full Invoice Aging.
- Automatic Posting To General Ledger **$195.00**

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- Random Access File Organization For Fast Updating Of Individual Records.
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Documentation, normally a problem for small systems users, is provided by the comprehensive series of Osborne and Associates user manuals. These three manuals together total over 800 pages of detailed step by step instructions written at three levels for DP Department Managers, Data Entry Operators, and Programmers. You don't have to worry about getting 'promises' instead of documentation because the documentation was written before the programs were developed. A second set of manuals details any changes required during conversion. Each program provided on disk with complete documentation. Packaged in a handsome three ring binder with pockets and twelve monthly dividers for convenient storage of reports.

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WORD PROCESSORS:

A User Manual Of Reviews

Len Lindsay
1929 Northport Drive #6,
Madison, WI 53704

This is the second installment of a continuing overview of word processors available today. See the FALL 79 issue of COMPUTE for the first installment, covering Connecticut Microcomputers Word Processor Program, Programma Internationals Word Processor, and Commodores Word Processor II.

You should know that I have USED every word processor I mention in this series. This is very significant. I do not rely on advertisements, announcements or even just manuals. I only review products that exist (and I KNOW they exist because I have a copy). The comments, of course, are strictly my opinion. I welcome your conflicting or agreeing comments. The accompanying chart can be used as a summary of sorts, comparing each word processor covered thus far.

In all fairness it should be noted that I use Commodores Word Processor III to do all my word processing. Before that came out I chose to use CMC's Word Processor Program. This of course is based on my needs. You must weigh each programs merits and decide which is best for your budget and needs.

Why am I so interested in word processors? A word processor program is one of the most significant uses you could have. With a printer, you will no longer need your typewriter. Even without the printer, you can send letters on tape to fellow PET computer users. My interest, of course, is increased since I do A LOT of writing.

An important consideration is the required system configuration. The Commodore Word Processor II & III require NEW ROMs, CBM Disk and a printer. *(Editor's Note: Word Pro II from Commodore is designed for 16 & 32K machines, Word Pro III is for 32K machines only. RCL)* Many of the others will work on either NEW or OLD ROMs, with or without printer, and tape or disk. Also, please remember that the PET printer responds to output different than the standard ASCII printer. The same exact output format can NOT be sent to both. Some of the programs take this into consideration and have print routines for both types. Some are easier to use than others. If your use will just be casual, you will not want to memorize a manual of complicated instructions. Programmas is an example of ease of use. Textcast is on the other end with extremely complicated instructions.

So much for my introduction. Here are the overviews of some more word processor programs for the PET.

	COMMODORE WORD PROCESSOR II	COMMODORE WORD PROCESSOR III	PROGRAMMA WORD PROCESSOR	CONNECTICUT MICRO COMPUTER WORD PROCESSOR PROG	TIS MEDIT	TEXTCAST
PRICE	$100	$200	$20	$30	$13	$60-65
OLD ROMs	NO	NO	YES	YES 1	YES	YES
NEW ROMs	YES	YES	YES	NO	YES	YES
MEMORY NEEDED	16K	32K	8K	8K	8K	8K
BASIC or ML	ML	ML	B	B	B	B&ML
CBM PRINTER	YES	YES	YES	NO*	YES	YES
ASCII PRINTER	YES	YES	YES	YES	YES	YES
CBM DISK	YES	YES	YES	NO 2	YES	YES
TAPE	NO	NO	YES	YES	YES	YES
FINAL OUTPUT TO SCREEN	NO	NO	YES	YES	YES	YES
VARIABLE LINESPACING	YES	YES	YES	YES	NO	NO
VARIABLE LINESPACING WITHIN TEXT	NO	YES	NO	YES	NO	NO
VARIABLE MARGINS	YES	YES	YES	YES	NO	YES
VARIABLE MARGINS WITHIN TEXT	NO	YES	NO	YES	NO	NO
SHIFT FOR UPPER CASE	YES	YES	YES	YES	YES	YES
ALL CAPS LOCK	YES	YES	YES	NO	NO	NO
AUTO REPEAT KEYS	YES (Non Letter)	YES (All)	NO*	NO*	NO*	YES (A Few)
CENTER TEXT	YES	YES	NO	YES	NO	ASCII only
RIGHT JUSTIFY	YES	YES	NO	NO	NO	YES
TAB CONTROL	YES (Input)	YES (Input)	YES (Print)	NO	NO	NO
EDIT	YES	YES	YES	YES	YES	YES
DELETE	YES	YES	YES	YES	YES	YES
INSERT	YES	YES	YES	YES	YES	YES
SEARCH	YES	YES	NO	NO	NO	NO
PAUSE	NO	YES (After Each Page)	NO	YES (On Command)	NO	YES (After Each Page)
VARIABLE BLOCKS	YES	YES	NO	NO	NO	NO
GLOBAL FUNCTIONS	NO	YES	NO	NO	NO	NO
HEADER	NO	YES	NO	NO	NO	NO
FOOTER	NO	YES	NO	NO	NO	NO
PAGE NUMBERING	NO	YES	NO	NO	NO	YES
SCROLLING TEXT (up & down)	YES	YES	NO	NO	NO	NO
ENHANCED PRINT	NO	YES	NO	YES 3	NO	YES
UNDERLINE	YES	YES	NO	YES	NO	ASCII
REVERSE FIELD PRINT	NO	NO	NO	YES 3	NO	YES
WORDS ON SCREEN SHIFT TO AVOID SPLITTING	NO	NO	NO	NO	NO	YES
ALL TEXT OF FILE IN MEMORY AT ONCE	YES	YES	YES	YES	YES	NO

*Routines may be added by user.

1 - With modifications supplied with manual

2 - Modifications to be supplied soon

3 - Via sending the corresponding ASCII code

MEDIT

MEDIT is a Text Editor available for $12.95 from TIS, PO Box 921, Los Alamos, NM 87544. Versions are available for use with PET Printer, ASCII printer, PET Floppy disk, and cassette.

First, you should be aware that this is a Text Editor, not a true Word Processor. It allows you to edit, save, and recall text. It cannot format it in any way. It will print it just as it is entered, line for line. It would take another formatting program used in conjunction with this to become a Word Processor.

The program comes with a 48 page manual that does a good job explaining how to use MEDIT. MEDIT can be run in lower case or graphics mode. It is line oriented text editor, but relies on a line pointer rather than numbering the lines on the screen for you.

The command I is for inserting text from the keyboard. However, you can not just type I and hit return. You must begin your text immediately following the I. This is rather confusing. To list 5 lines you type 5L (the number comes before the command). T takes you to the top of text while B takes you to the bottom. As you move up or down your text, no lines are printed on your screen. To see where you are you must enter the List command.

Reading and writing your text to and from tape/disk is a three part process. First you open the file, specifying the filename. Then you read or write what is needed. When you are through you must issue a Close file command. I prefer being able to simply SAVE my file. But the MEDIT method allows you to save any segment of lines you wish. You can save several segments one after another before closing the file. That is an advantage.

Below is a list of MEDIT commands.

BOTTOM. The command B moves the line pointer to the bottom line (the last existing line).

TOP. The command T moves the line pointer to the top of text (the first existing line).

INSERT. The command I inserts the rest of that line following the current line. After that you are in the input mode and continue entering text.

QUIT. The command Q will exit MEDIT without copying any more files. The command X will exit after copying the rest of the IN file to the OUT file.

ADVANCE. The command A (preceded by a number) will advance the line pointer by the number of lines indicated by the preceding number.

LIST. The command L (preceded by a number) will list (on your screen) that number of lines, beginning with the current line.

PRINT. The command P (preceded by a number) will print to the printer the number of lines indicated. They are not formatted, but printed exactly as stored.

KILL. The command K (preceded by a number) will kill (or delete) the number of lines requested, beginning with the current line number.

READ. The command R (preceded by a number) will read (input) that number of lines from the INPUT file. It is preceded by the command ER to open the read file. The file is closed by the command EC.

WRITE. The command W (preceded by a number) will write (output) that number of lines to the OUTPUT file. It is preceded by the command EW to open the write file. The file is closed either by the command EF or by ET which also puts out an end of tape (EOT) signal.

STATISTICS. The command EQ will display the current MEDIT statistics.

MODES. The command EL will put you into lowercase mode while the command EU selects the upper case with graphics mode.

MODIFY. This command will display the current line and allow you to make modifications as desired. When the PET sees the RETURN key hit, the new line will take the place of the previous one.

TEXTCAST

Textcast is available from Textcast, PO Box 2592, Chapel Hill, NC 27514. On cassette it costs $60, on diskette $65, or the manual alone is available for $20. Editor's Note: See the Table of Contents for an alternate review of Textcast. RCL...

This program is in a class all by itself. It is written in BASIC with an additional 3K of Machine Language subroutines. These machine language subroutines allow for FAST keyboard text entry. Editing is done from tape to tape OR disk to disk, editing each screenful of information one at a time (and no backtracking). Printing is also done screen by screen. The most amazing aspect of this program is that it doesn't allow words to be 'split' due to the screen wrap around. If you are typing a word that would extend past your present screen line onto the next line, it erases the entire word on the current line and in the blink of an eye, zap it is at the beginning of the next line.

It includes many other unusual features such as packing your text, which deletes all extra spaces from the text. It's repeat key function is rather clumsy. You must hit the key, let up, and then hold it down to get repeat action. And then, the repeat cursor movements are invisible - you do not know where the cursor is until you let up on the

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- Aged accounts receivable statements with automatic printing of aged statements of account for active accounts.
- Payments may be entered either against invoice number or outstanding balance. A printed statement of payments received shows date, amount, account name and number, check number or notation for cash payment, and listing of all invoices credited to provide an audit trail of transactions.
- Single or multiple item invoices with automatic extensions and calculaton of multiple line items.
- Multiple classifications of account within taxable or non-taxable categories.
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key and surprise, there it is! Both the up arrow and arrow across keys have been redefined as cursor up and cursor left respectively. Thus each of the four cursor movements are available without shifting.

So much for the interesting aspects of the program. Of all the word processing programs I have used, this is the most complicated to use and understand. It seems that it is intended to be used for data entry and verification and word processing in addition to that. It's special commands are not easy to remember, like LS for line spacing or Control O for Output. Rather Shift # means print and Shift ! means pack the words in the paragraph.

It's structure of piece by piece editing allows for large amounts of text to be processed on only an 8K PET. However, since I have a 32K PET, I prefer to edit my text in large logical sections, not just what fits on the screen at one time. No more than 4 screen lines can be inserted per screen while editing. This makes its use complicated.

Textcast comes with a 41 page manual. It is hard to give a run down of the commands, but here is an attempt.

INSERT. The insert key functions as usual to insert a space into a line. A whole blank line can be inserted by hitting the RVS key.

DELETE. The delete key functions as usual to delete one character. To delete a whole line hold SHIFT and the RVS key.

PACK. Hit SHIFT ! and the extra spaces will be deleted from the paragraph starting at your cursor position. This is done very quickly.

STORE. Hit SHIFT @ and the four lines beginning with the cursor position will be stored for future recall (but not for printing).

REVIEW. SHIFT (allows you to see (and review) the four lines in storage. Hit SPACE and they disappear again.

RECALL. SHIFT '' (quote symbol) will recall the four lines in storage and insert them immediately preceding the cursor position.

ADVANCE. To blank out the present screen and read in the next one hit SHIFT).

ALIGN. This is a unusual function. Each time you hit SHIFT = everything on the screen is shifted over to the right one space. This is to allow another unusual aspect of the program. You can fast forward your tape in the middle of a read. Thus you may end up at any point within the logical 39 character lines of a TEXTCAST file. The align command shifts everything over. Doing this several times allows you to put the beginning of the lines where they belong.

SAVE. Hit the backslash key and the current screen of text is saved to the output file. Hit SHIFTed backslash to save the screen and end the output file. Hit SHIFTed backslash to save the screen and end the session. Before saving a page of information, you must remember to place the cursor below the last line you wish to save. I lost parts of my input while using TEXTCAST because I forgot to place my cursor correctly.

FILE NAMES. Text files can be saved to tape or disk by name. For use with tapes, this is a good feature. It is a necessity for disk. But it is cumbersome with disk, for you can't just call it EXAMPLE. You must include the disk number and a colon as the beginning of the file name. If you forget it will save it to tape.

PRINT. SHIFT # will print the contents of the screen onto your printer. It is extremely important where you place your cursor when printing a page from the screen. It only prints up to your cursor position. I forget this all the time and have to start over again (I am too used to an automatic print file-type word processor program).

WORD PROCESSOR III

Commodores Word Processor III has all the features of their Word Processor II plus many more. Disk files are upgradable from the II to the III with only slight modifications. The Word Pro III is what I used to write this article.

The major advances are that many of its functions can now be local to the file within the PETs memory, or global to files on both disks. Formatting is dynamic and can be changed from within your text via embedded format commands. Your pages can be numbered, with a header and foot on each page. Lets take a closer look at the Word Pro III commands and features.

TWO TEXT AREAS. The Word Pro III features two separate text areas. One is the main text area and the other is the alternate text area. The alternate text area has several uses. You can switch from one to the other by hitting CONTROL X (exchange). The RVS key has been redefined as the CONTROL key.

APPEND. Whole sentences or paragraphs can be stored in the alternate text area, including an identification name or number. They then can be called into the main text at any time with CONTROL A command.

VARIABLE BLOCK. You can include variable blocks within your text. This allows you to create personalized form letters automatically. The text to be placed in the variable blocks is stored in correct sequence in the alternate text area. One piece of text is needed for each variable block. When the text is printed, the PET will automatically fill in the variables. You may include text for several letters, one after another in the alternate text text area and the PET can then print each text one after another - automatically.

TABS. You may set and clear tab positions to be used while entering your text. If you would like to indent each paragraph 10 spaces, you simply set a tab marker at column 10. While entering your text simply hit the arrow across key and the cursor jumps to the next tab position. CONTROL S sets tabs and CONTROL C clears them.

NUMERIC MODE. With numeric mode ON any numbers entered within your text will display as on a calculator. For example - you will enter a description of an item at the left margin. Then tab over to column 35 which is the column you would like to have all the prices end, so they will be right justified, and all decimal points lined up evenly. So you enter the item, DESK, and hit the tab key. You now enter the amount, say 364.95. As you entered the number, your cursor remained in column 35 (the column we tabbed to). When you hit the 3 it appeared just to the left of the cursor. Then you hit the 6. The 3 moved one column over to the left and the 6 appeared in the column just to the left of the cursor. Next you hit the 4 and both the 3 and 6 moved one column over to the left making room for the 4 to appear just to the left of the cursor (which still is in column 35). You finish typing the .95 and hit return. The next line you type an item, CHAIR, and hit tab. Once again your cursor is in column 35. Now enter the amount, say 89.50. This amount doesn't have a hundreds digit, but never-the-less the decimal points are lined up neatly. Remember to turn Numeric mode off when typing normal text.

DELETE. You can delete characters one at a time (with fast repeat for quick backwards deletion). You may also delete one screen line at a time which is quicker. There is one other method you may use. When editing the text on the screen you may wish to see what it will look like with a part deleted. But if you delete it, normally it is GONE and you can't get it back. Hit CONTROL D and you are in a special Delete mode. To delete the next word hit W. The next word lights up. To delete the next sentence (or remainder of a sentence) hit S. Once you have everything lit up that you are considering deleting you may analyze the situation. If it appears acceptable simply hit RETURN and the lighted up sections disappear. If you change your mind, simply hit CONTROL and you are back to normal mode, all text intact.

ERASE. In addition to the Delete methods mentioned above you can enter the erase mode by hitting CONTROL E. Next hit A and all text is erased. Or hit R and the remainder of text is erased (everything after the cursor position). Or hit L and the lines you previously defined with the Range command below will be erased.

RANGE. This command is used to define a range of lines that may be referred to by other commands later. Simply hit CONTROL R and the line your cursor is on lights up. Hit cursor down and the line below lights up. Continue till you have your range lit up. Then hit RETURN and the range is defined.

GOTO. Although with a beautiful character oriented screen display you do not worry about line numbers, this command is available. You may have your cursor sent to any line you wish simply by hitting CONTROL G followed by the number of the line.

GLOBAL FUNCTIONS. Special commands for automatic text location and alteration are included. They can be used locally within the text in the PETs memory, or Globally using files stored on either disk. Functions include Modify, Find, Search and Replace, and Hunt (a quick find).

Printing the final text can also be done globally, continually printing one file after another from disk. The pages stay even, and page numbering, etc. goes on as if all the files were one big text file.

To be able to use the Global functions each file on disk must have a special FINAL line. It must be NX:name. The NX stands for Next. The file name you put after the NX will be the next file taken off disk for whatever global operation is taking place.

TRANSFER. This function lets you move any section of text from one place to another. First use the Range function to identify the range of lines for the transfer.

FILE CONTROL. File control (LOADing and SAVEing text) is very simple and includes prompts to help the user. Hit SHIFT HOME key to get into this mode. The top status line will prompt you with RECALL, MEMORIZE, OR INSERT.

RECALL. Recall is the business world equivalent of LOAD. If you wish to recall a text file on disk simply hit R. You then will be asked for the file name. Both disks will be searched, so you need not specify which disk. All present text will be erased before the new text is loaded.

INSERT. Hit I (instead of R for recall as above) and you may insert text from disk into the current cursor position. As with Recall, you simply supply the file name to be inserted.

MEMORIZE. Memorize is the business world equivalent of SAVE. Hit M to memorize the present file (or segment of the file) to disk. It will ask you for disk drive number. Simply hit 0 for drive 0 or 1 for drive 1. If you have already defined a block of lines with the Range command, you may save just those lines by replying to the drive number inquiry with R for range followed by the drive number. Finally you supply the text file name for the SAVE. If a file with the name you give already exists on disk, the program will ask if you want to replace it. Hit RETURN and it will replace it with the present file (very good for updating your files). Or if you don't want it replaced (and would rather rename the present file) simply hit CONTROL.

AUTO FILE NAME. When asked for a file name, there is an easy way to have the PET type it for you. Answering with a backslash as the name tells the PET to use the next 16 characters beginning with the cursor position for the name. So, simply start your files with a comment including the file name, put the cursor on the start of the name and then enter the File Control mode.

DISK DIRECTORY. Simply hit CONTROL 1 to get a directory of drive 1 or CONTROL 0 to get a directory of drive 0. This directory is very handy. To load any of the textfiles, simply cursor down to the file name, hit SHIFT HOME, hit R for recall, and end by hitting the backslash for file name. The PET types the name from your cursor position. Easy huh!

ESCAPE. You can hit the CONTROL key to escape from any function you have started if you change your mind.

FORMATTING FUNCTIONS. Here is a quick run down of the formatting functions that can be imbedded within your text (preceded by a checkmark).

PP - PRINTER PAGE: sets the number of lines that fit on one page.

LF - LINE FEED: sends a carriage return and line feed to printer.

JU - JUSTIFY: justifies both margins.

SP - SPACING: sets the line spacing (1 for single spacing, 2 for double spacing).

RM - RIGHT MARGIN: sets the right margin

LM - LEFT MARGIN: sets the left margin

DV - DEVICE: sets the output device (so you can alternate from printer to printer).

PG - PAGING: sets the number of lines to be printed on a page before ejecting to the top of the next page.

LN - LINE FEED: does the specified number of line feeds.

MA - MARGIN RELEASE: moves the left margin over as specified only for the current line.

CN - CENTERING: centers all text that follows.

RA - RIGHT ALIGNMENT: justifies only the right margin, the left is jagged.

HD - HEADER: create the header line for all printed pages.

FT - FOOTER: create the footer line for all printed pages.

P# - PAGE NUMBER: sets the starting page number.

FP - FORCED PAGING: forces paging to the next page if the specified number of lines are not available on the current page.

NX - NEXT FILE: links to the next file name specified.

CM - COMMENT: comment only, will not be printed.

Most of these functions require a number immediately following its two letter identification. For ON / OFF functions 1 means on and 0 means off. The Header and Footer require three sections of text. The first will be printed flush left, the second will be centered, the third will be printed flush right. You may include the page number in any of these sections, indicating it by these two characters: ( ). Several functions may be included on one line if seperated by a colon (:).

PRELIMINARY

I have been using a preliminary copy of WP III for over two months now. The final version should be available very soon. Contact Commodore Business Machines, Inc., 3330 Scott Blvd., Santa Clara, CA 95059 for price and availability. It should come as a diskette, ROM chip, and manual. The entire contents of the manual are also included as text files on the diskette, allowing you to see how the manual was set up (formatting etc) as well as permitting you to print out your own copy of the manual on any size paper you have.

FINAL NOTES

This concludes part two of an overview of current word processing programs. Next issue will continue with more programs. Connecticut Microcomputers Word Processor Program Version 2 hopefully will be available for next issue, as well as Commodores Word Processor I for the 8K PET. Also I have CONTEXT EDITOR working on the PET with disk or tape, full justification, dynamic formatting, and more. Programma should have their new Super Word Processor program available too, with a personal customization available.

Please send your comments to Len Lindsay, 1929 Northport Dr., Room 6, Madison, WI 53704. If I am missing any word processor please send me a copy so it can be included in the future. Anybody out there seen the Computer Factory's Word Processor? Or the one from New York? Or from Canada? See you next issue!

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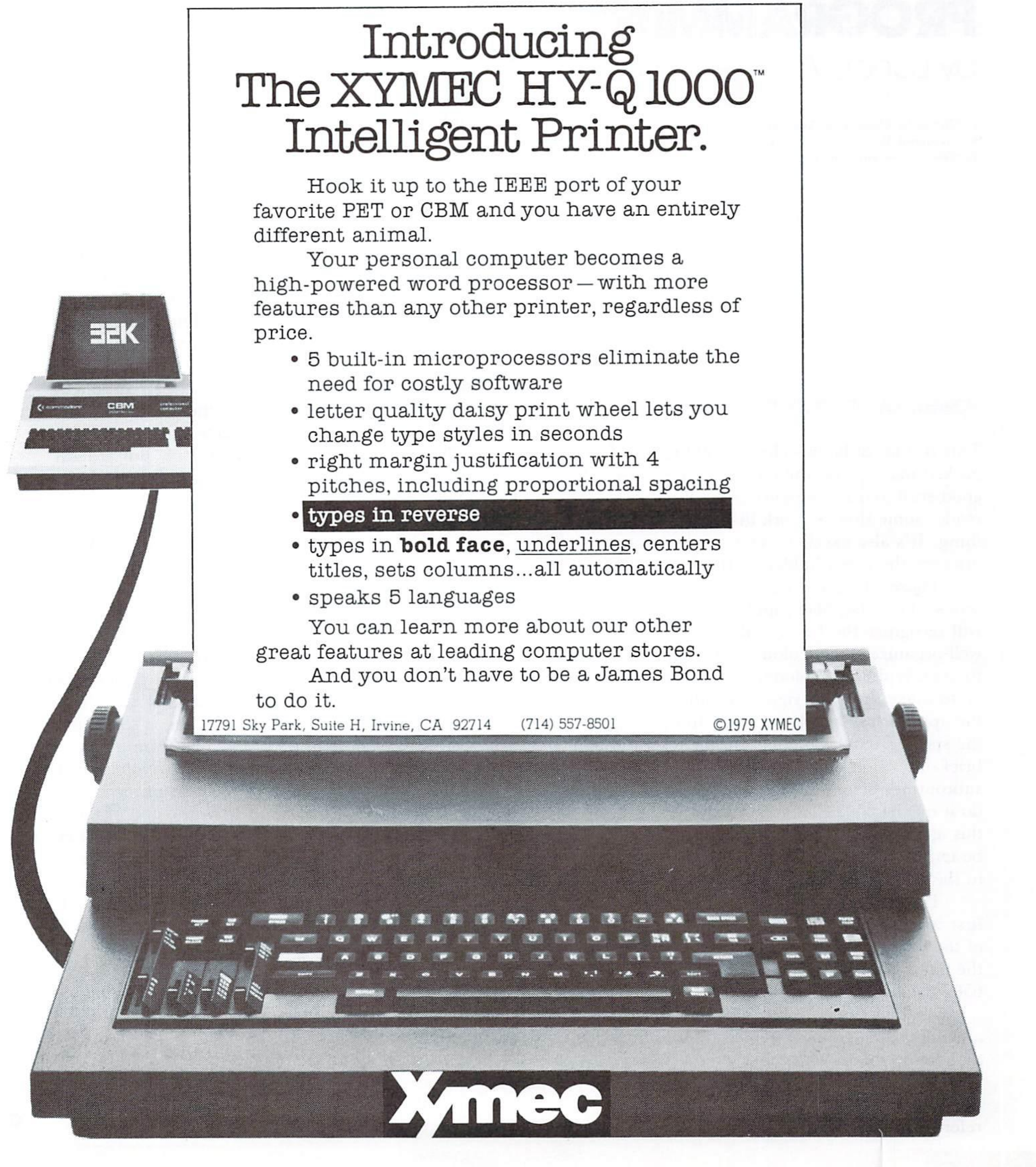

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Book Review

6502 ASSEMBLY LANGUAGE PROGRAMMING

by Lance A. Leventhal

Published by Osborne & Associates, Inc.
630 Bancroft Way
Berkeley, California 94710

Review by Jim Butterfield

This is a lot of book - close to 600 pages of closely-packed material on the 6502 microprocessor. It's good stuff and it's weighty stuff: it will take a reader some time to work his way through the whole thing. It's also excellent as a reference once you discover the index hidden at the front of the book.

Those who have seen previous books in the series - for 8080, 6800, and Z80 microprocessors - will recognize the Leventhal style. It's thorough, well-organized, meticulous and complete .. and frequently dull and plodding. The objective seems to be to make the book rigorous rather than tutorial; the approach is usually to work from the general to the specific. For example, you must go through a brief discussion of how other microprocessors invoke subroutines before getting into the details of how to do it on the 6502. There's much to be said for this approach, of course. But many beginners will be tempted to think that it takes too long to get to the meat of the subject.

The book is organized into sixteen chapters. The first two chapters deal with the general subjects of the levels of various computer languages and of the nature of an assembler; you don't reach the 6502 itself until chapter three.

Chapter three deals with the 6502. It starts with a general discussion of the chip, outlining registers, addressing modes and other general considerations. It abruptly changes and meticulously lists the instruction set in alphabetical order. Marvellous for reference, but tough sledding for the beginner who will want to skip to the following chapter where the going gets much easier.

Chapters four through ten are pure gold for the beginner. They constitute a 'recipe book' of little programs, showing how to go about coding small tasks. Even experienced programmers will find worth while material here. The author starts with simple programs and introduces new concepts step by step. From time to time, the user is challenged with carefully chosen problems.

Chapter eleven, which deals with Input/Output, is the longest in the book. It deals with a remarkable number of interface chips: the 6520, 6522, 6530, and 6532; A/D and D/A converters; and 6850 and 6551 UARTs. Reference charts and sample programs are liberally supplied. At 129 pages, this chapter could stand by itself as a book!

I couldn't find a description of one register of the 6522 (the IER) in chapter eleven. It turned up in chapter twelve, which deals with interrupts from both a hardware and programming standpoint.

Chapters thirteen through fifteen deal with methodology rather than mechanics. Problem definition, program design, debugging, testing, documentation and redesign are subjects which are often glossed over; Leventhal gives them serious discussion. These are controversial subjects and not everyone will agree with their treatment here. But at least the reader is made aware of some of the techniques. Whether he agrees with them or not, meeting them is a worth while exercise.

I have minor complaints about the book, mostly in the early chapters where 6502 coding is outlined. Because of the author's emphasis on assembly level langauge he makes little distinction between absolute and zero page addressing; yet there are important differences, especially where indexing is used. He likes to put his sample programs in zero page, which most programmers jealously guard for variable and indirect address space. His wording is sometimes awkward or obscure. Try this one from his description of relative branch addressing: ''Note that the instruction itself occupies two bytes of memory and the offset is measured from the end of the instruction. Thus the offset should be 3 to generate a branch to the location five beyond the one in which the first byte of the instruction is located.'' It's correct, of course; but I need to take two or three passes at that second sentence before I can follow it.

But these are minor complaints for a volume of this scope and size. With its numerous reference tables, its explanations and descriptions, and its sample programs, this book is a major accomplishment. It's by far the most complete 6502 book to appear so far.

Make space on your bookshelf. You'll want to keep this one handy.

HDE inc.

BOX 120
ALLAMUCHY, N.J. 07820
201-362-6574

HUDSON DIGITAL ELECTRONICS INC.

THE HDE DISK SYSTEM.

HERE'S WHAT ONE USER HAS TO SAY . . .

REPRINTED BY PERMISSION FROM THE 6502 USER NOTES - ISSUE NO. 14

PRODUCT REVIEW of the HDE DISC SYSTEM by the editor.

A number of you have asked for details about the HDE full size disc system.

The system is based around the SYKES 8" drive with the 6502 based intelligent controller.

This drive is soft sectored, IBM compatible, and single density which lets you store about a quarter megabyte of data on a disc.

The system software, called FODS (File Oriented Disc System), manages sequential files on the disc much the same way files are written on magnetic tape - one after another. When a file is deleted, from a sequentially managed file system, the space that the file occupied is not immediately reallocated, as in some disc operating systems. As it turns out, this can be an advantage as well as a disadvantage since deleted files on the FODS system can be recovered after the file has been deleted. (This has saved my sanity more than once!) Of course when you want to recover some of the disc space taken up by a number of these deleted files, you can simply re-pack or compress the disc and all the active files will be shifted down until there are no deleted files hanging around using up space.

FODS has this ability to repack a disc.

When saving and loading in FODS you work with named files, not track and sector data or I.D. bytes. This makes life a lot easier. I've seen some disc systems where you have to specify track and sector info and/or I.D. bytes. What a pain that can be!

If you just want to save a source file temporarily, you can do that on what's known as "scratch-pads". There are two of these on a disc, "scratch-pad A" and "scratch-pad B", each of these temporary disc files can hold up to 16K or if "B" is not used, "A" can hold one file up to 32K in length. The only files that can be temporarily saved on scratch pad are files that have been built using the system text editor.

Being a dyed in the wool assembly language programmer, I really appreciate the FODS text editor! This line oriented editor is upwards compatible with the MOS/ARESCO editor but includes about everything you could ask for in a line editor. There is a full and semi-automatic line numbering feature, lines can be edited while they are being entered or recalled and edited later, strings can be located and substituted, the line numbers can be resequenced, the file size can be found, the hex address of a line can be known and comments can be appended to an assembly file after it has been found correct. Oops! I forgot to say lines can also be moved around and deleted. This isn't the complete list of FODS editor commands, just the ones that immediately come to mind.

Another very powerful feature of the system is the ability to actually execute a file containing a string of commands. For example, the newsletter mailing list is now being stored on disc. When I want to make labels, I would normally have to load each letter file and run the labels printing program. But with FODS, I can build up a "JOB" file of commands and execute it.

The job file in turn calls each lettered label file in and runs the label printer automatically. The way computers are supposed to operate right?

Here's a listing of the job file I use to print mailing labels:

```
:LIS PRTLBL
0005 LOD A:RUN %LABEL:LOD B:JMP.E000:
LOD C:JMP.E000:
0010 LOD D:JMP.E000:LOD E:JMP.E000:
LOD F:JMP.E000:
0015 LOD G:JMP.E000:LOD H:JMP.E000:
LOD I:JMP.E000:
0020 LOD J:JMP.E000:LOD K:JMP .E000:
LOD L:JMP.E000:
0025 LOD M:JMP.E000:LOD MC: JMP.E000:
LOD N:JMP.E000:
0030 LOD O:JMP.E000:LOD P:JMP .E000:
LOD R:JMP.E000:
0035 LOD S:JMP.E000:LOD T:JMP .E000:
LOD V:JMP.E000:
0035 LOD S:JMP.E000:LOD T:JMP .E000:
LOD V:JMP.E000:
0040 LOD W:JMP.E000:LOD XYZ: JMP.E000:
0045 LOD EXCH:JMP.E000:LOD COMP:
JMP.E000:
```

Remember the MOS/ARESCO assembler I reviewed several issues ago? Well HDE went and fixed up all the problem areas that I mentioned in the review and then took it several steps further. The HDE assembler is an honest to goodness two-pass assembler which can assemble anywhere in memory using multiple source files from the disc. The assembler is an optional part of the system.

If you're the kind of person (as I am) who enjoys having the ability to customize, modify, and expand everything you own - you'll enjoy the system expansion abilities FODS has to offer. Adding a new command is as simple as writing the program, giving it a unique three letter name and saving it to disc. Whenever you type those three letters the system will first go through its own command table, see that its not there and then go out and read the disc directory to see if it can find it. If it's on the disc it will read it in and execute it. Simple right? I've added several commands to my system and REALLY appreciate having this ability. Some of the things I've added include a disassembler, an expanded version of XIM (the extended machine language monitor from Pyramid Data), Hypertape, and a number of system utilities which make life easier. By the way, to get back to the system, all you need to do is execute a BRK instruction.

HDE also provides a piece of software that lets you interface Microsoft 9 digit BASIC to their disc system. The software allows you to load the BASIC interpreter itself from disc as well as saving and loading BASIC Programs to and from the disc. This particular version of the software doesn't allow for saving BASIC data but HDE mentioned that this ability may be possible with a future version.

The first thing I do with a new piece of software after I get used to using it is try to blow it up. I did manage to find a weak spot or two in the very first version of FODS (a pre-release version) but the later, release version has been very tight.

The standard software that is included with the system consists of the disc driver software, the system text editor and the BASIC software interface. Several command extensions may also be included. All the necessary stuff like a power supply, the KIM-4 interface card, and all cables and connectors are included. It took me about 45 minutes to get things up and running the first time I put the system together.

Admittedly, a dual full size disc system from HDE is probably beyond the means of most hobbyists but if you or your company is looking for a dynamite 6502 development system, I would recommend this one. I've used the Rockwell System 65 while I was at MOS and feel that dollar for dollar, feature for feature, the HDE system comes out on top. The only place the HDE system falls short when stacked up next to the System 65 is in the area of packaging. At this point, there is no cabinet for the disc drives available from HDE.

So far, I've got nothing but good things to say about HDE and their products. Everything I've received from them has been industrial quality. That includes their documentation and product support. I'm very impressed with what I've seen from this company so far and quite enthusiastic over what my KIM has become since acquiring the disc system and its associated software.

ERIC

THANK YOU MR. REHNKE!

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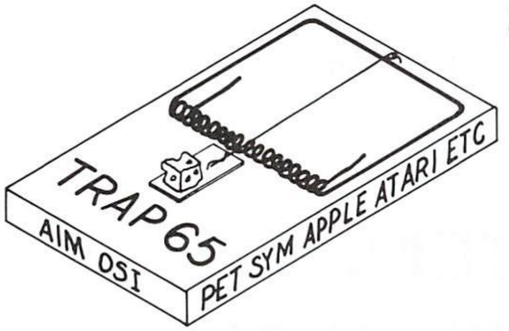
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PRO-GRESS

Multiple Regression Program
for PET/CBM Computers

INPUT

* Read data from tapes or CBM disk. Concatenate files. * Select records. Delete cases with missing data. * Transform variables. Generate new variables. * Optional keyboard input of means, standard deviations, correlations.

MODEL

* Any subset of variables as predictors. * Multiple dependent variables on a single run.

OUTPUT

* Variable names and title. * Statistics: means, standard deviations, correlations; R, R-Square, F, degrees of freedom; constant and coefficients, betas, Student's t's. * Output to screen, or to ASCII or CBM printer. * Optional screen plot: residuals versus predicted values.

LIMITS

* Maximum 10 predictors in 8K; 25 in 16K; 45 in 32K. * No limit on number of records. Approximate timing: .25 minutes per 100 records with one predictor; 30 minutes per 100 records with 45 predictors.

PRODUCT DESCRIPTION

* Two programs and a manual. Program I has elaborated instructions, requires 16K or 32K. Program II has abbreviated instructions, runs in 8K or more. * Cassette tape: $45. Disk: $50. Manual separately: $15.

Order both PRO-GRESS and the TEXTCAST word processing program for creating data files and writing reports. * Two cassette tapes: $80 ($105 value); disk with all programs: $85 ($115 value).

PRO-GRESS
Cognitive Products, P.O. Box 2592, Chapel Hill, NC 27514

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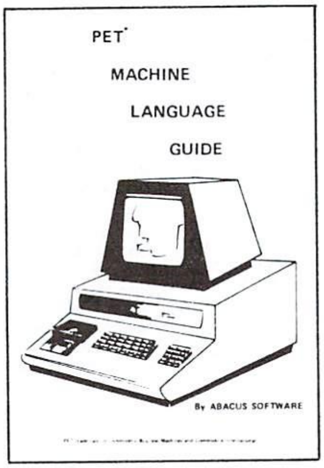
PET' MACHINE LANGUAGE GUIDE


PET*
MACHINE
LANGUAGE
GUIDE

By ABACUS SOFTWARE

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Grand Rapids, Michigan 49510

Machine Language Versus Basic Prime Number Generation

Marvin L. De Jong

Dept. of Math-Physics
The School of the Ozarks
Pt. Lookout, MO 65726

Editor's Note:
Watch your local dealer for Marvin L. De Jong's new book: ***Programming and Interfacing the 6502.*** *Due in January, the 450 page work is expected to sell for $11.95. Publisher:*
Howard W. Sams Co.
Indianapolis, IN.

The attached program will calculate prime numbers of the form $2^N - 1$, for poster and/or prime number enthusiasts who also read COMPUTE. It was motivated by one of my students who was searching for perfect numbers (numbers whose factors add to give the number itself). The student wrote a BASIC program for an APPLE, and the program would calculate and print 2^{10000}. It took 11 hours to do this. Thinking that perhaps the same thing could be done in machine language, I wrote the program given here with only minor modifications. It calculated 2^{10000} in 11 minutes, illustrating the advantage in speed that machine language offers for certain tasks.

The program listed here calculates and prints $2^{11213} - 1$, a number that is known to be prime. With a little more memory space than the 4K on my AIM 65, one could calculate and print the largest known prime (as of this writing) number, namely $2^{44497} - 1$. The number of digits in a number of the form 2^N can be shown to be 1 + Nlog2. In the program given we calculate 2^{11213} giving the number of digits as $1 + 11213\text{Log}_{10}(2) = 3376$ digits. The number 2^{44497} requires 13395 digits. Each memory location can store two BCD digits, so 2^{11213}, requires 1688 or about 2K locations in memory.

Some notes on the program follow. We allocated locations $0400 to $0FFF to hold the number. This is many more locations than are required to find 2^{11213}, but the program was used to find some larger powers of two also. First, the locations that are to contain the number are cleared to zero. This occurs in instructions $0208 to $0220. The indirect indexed addressing mode is used to reference the memory locations to be cleared. The address of this table is stored in $0004 and $0005. Next, a one is stored in the lowest address of the table. This number is doubled 11213 times giving 2^{11213}. The locations $0000, $0001, and $0002 keep track of the number of doubling times. In the instructions located from $0261 to $0272 this number is tested to see if it has reached 11213. Finally, one is subtracted from the number and it is printed by calling an AIM 65 subroutine at $F000. Owners of other systems can simply use their own output subroutine. It should also be clear from this explanation and the program comments what locations in the program must be modified to handle other numbers of the form 2^N.

There is really no practical use for the program or the output. However, prime numbers and perfect numbers have been of considerable interest to mathematicians for centuries. Perhaps some 6502 user will discover an even larger prime number than 2^{44497}, but don't underestimate the task.

P.S. A lot of leading zeros get printed before the number starts.

```
$0208  A9 00      START  LDA $00         Load pointers to number table.
 020A  85 04             STA TABLE
 020C  A9 04             LDA $04
 020E  85 05             STA TABLE+1
 0210  A0 00             LDY $00         Initialize Y index to zero to
 0212  A9 00      NEXT   LDA $00         clear all table locations to zero.
 0214  91 04      LOOP   STA (TABLE),Y   Put zero in each table location.
 0216  C8                INY             Increment Y to fill page with zeros.
 0217  D0 FB             BNE LOOP
 0219  E6 05             INC TABLE+1     Go to the next page in the table.
 021B  A5 05             LDA TABLE+1     Are all the pages completed?
 021D  C9 10             CMP $10
 021F  90 F1             BCC NEXT        No. Then fill another page.
 0221  A9 04             LDA $04         Yes.  Reset pointers to the base
 0223  85 05             STA TABLE+1     address of the table.
 0225  F8                SED             All subsequent additions will be
 0226  A9 01             LDA $01         in decimal.
 0228  8D 00 04          STA TABLO       Start with one in lowest digit of
 022B  A9 00             LDA $00         the table.
 022D  85 00             STA LO          Initialize the addition counter to
 022F  85 01             STA MID         zero;  three locations ($00,$01,$02)
```

```
0231  85 02              STA HI           in page zero.
0233  18        COUNT    CLC              Clear carry for additions.
0234  A9 01              LDA $01          Increment the addition counter,
0236  65 00              ADC LO           LO, MID, and HI each time the number
0238  85 00              STA LO           is added to itself.
023A  A5 01              LDA MID          Carry from LO addition into MID.
023C  69 00              ADC $00
023E  85 01              STA MID          Result into MID.
0240  A5 02              LDA HI           Carry from MID addition into HI.
0242  69 00              ADC $00
0244  85 02              STA HI           Result into HI.
0246  18                 CLC              Clear carry for adding THE NUMBER.
0247  B1 04     PAGAD    LDA (TABLE),Y    Get a piece of THE NUMBER.
0249  71 04              ADC (TABLE),Y    Add it to itself.
024B  91 04              STA (TABLE),Y    Store THE NUMBER.
024D  C8                 INY              Increment Y to repeat the addition
024E  D0 F7              BNE PAGAD        for an entire page of memory.
0250  E6 05              INC TABLE+1      Increment the page number.
0252  08                 PHP              Store P to keep track of any carry.
0253  A5 05              LDA TABLE+1      Have we finished adding the entire
0255  C9 10              CMP $10          table?
0257  B0 04              BCS DOWN         Yes.  Then check to see if we have
0259  28                 PLP              added enough times.  No.  Add more.
025A  4C 47 02           JMP PAGAD
025D  A9 04     DOWN     LDA $04          Reset table pointer.
025F  85 05              STA TABLE+1
0261  A5 00              LDA LO           Check add counter.  Is it equal to
0263  C9 13              CMP $13          011213?
0265  D0 CC              BNE COUNT
0267  A5 01              LDA MID
0269  C9 12              CMP $12
026B  D0 C6              BNE COUNT
026D  A5 02              LDA HI
026F  C9 01              CMP $01
0271  90 C0              BCC COUNT
$0273 18                 CLC               Subtract one from 2^11213 to get
0274  AD 00 04           LDA TABLO         THE PRIME NUMBER.
0277  E9 00              SBC $00
0279  8D 00 04           STA TABLO
027C  A9 0F              LDA $0F           Point to the top of the table to
027E  85 05              STA TABLE+1       read THE PRIME NUMBER out from
0280  A0 FF     UP       LDY $FF           the most-significant digit to the
0282  B1 04     THERE    LDA (TABLE),Y     least-significant digit.
0284  A2 FE              LDX $FE           Convert the BCD digits to ASCII.
0286  48                 PHA               Save two digits on the stack.
0287  4A                 LSR A             Get the most-significant nibble.
0288  4A                 LSR A             Move it into the low-order nibble.
0289  4A                 LSR A
028A  4A                 LSR A
028B  18        HERE     CLC
028C  69 30              ADC $30           Here we have an ASCII digit so
028E  20 00 F0           JSR PRINT         jump to the output routine.
0291  E8                 INX               Do we need to get another digit?
0292  F0 06              BEQ AHED          No.
0294  68                 PLA               Yes.  Get the digits.
0295  29 0F              AND $0F           Mask the high-order nibble.
0297  4C 8B 02           JMP HERE          Convert it to ASCII.
029A  88        AHED     DEY               Get some more of the number from
029B  C0 FF              CPY $FF           the same page.
029D  D0 E3              BNE THERE
029F  C6 05              DEC TABLE+1       Change pages.
02A1  A5 05              LDA TABLE+1
02A3  C9 04              CMP $04
02A5  B0 D9              BCS UP
02A7  00                 BRK               Back to the monitor.
```

BASIC MEMORY MAP(PAGE 0)

Compiled by
Jim Butterfield, Toronto

The following list was compiled by examining individual machines. While the information is believed to be accurate, it may not apply to all versions or implementations of Basic the user may encounter. (PET is 'upgrade ROM'; APPL is Applesoft)

KIM	AIM	SYM	PET	APPL	Description
0000	0000				New-line jump
0003	0003	000A	0000		USR jump
0006	B006	0008			Vector to 'fixed-to-floating' subroutine
0008	B008	0006			Vector to 'floating-to-fixed' subroutine
000A	0006	000D	0003	000D	Search character
000B	0007	000E	0004	000E	Scan-between-quotes flag
000C	0008	000F	0005	000F	Input buffer pointer; # of subscripts
000D	0009	0010	0006	0010	Defaault DIM flag
000E	000A	0011	0007	0011	Type: FF=string, 00=numeric
000F	000B	0012	0008	0012	Type: 80=integer, 00=floating point
0010	000C	0013	0009	0013	Flag: DATA scan; LIST quote; memory
0011	000D	0014	000A	0014	Subscript flag; FNX flag
0012	000E	0015	000B	0015	0=INPUT; $40=GET; $98=READ
0013	000F	0016	000C	0016	Comparison Evaluation flag
0014	0010	0017	000D		Input flag (suppress output)
0016	0011	0019	00C6	0024	Position on print line
0017	0012	001A			Maximum print line width
0018	0013	001B			Input column limit
0019	0014	001C	0011	0050	Integer value (for GOTO etc)
001B	0016	001E	0200	0200	Start of input buffer
0062	005D	0065	0250	02FF	End of input buffer
0063	005E	0066	0013	0052	Pointers for descriptor stack
0066	0061	0069	0016	0055	Descriptor stack(temp strings)
006E	0069	0071	001E	005D	End of Descriptor stack
006F	0072	0072	001F	005E	Utility pointeer area
0073	006E	0076	0023	0062	Product area for multiplication
0078	0073	007B	0028	0067	Pointer: Start-of-Basic
007A	0075	007D	002A	0069	Pointer: Start-of-Variables
007C	0077	007E	002C	006B	Pointer: Start-of-Arrays
007E	0079	0081	002E	006D	Pointer: End-of-Arrays
0080	007B	0083	0030	006F	Pointer: String-storage(moving down)
0082	007D	0085	0032	0071	Utility string pointer
0084	007F	0087	0034	0073	Pointer: Limit-of-memory
0086	0081	0089	0036	0075	Current Basic line number
0088	0083	008B	0038	0077	Previous Basic line number
008A	0085	008D	003A	0079	Pointer: Basic statement for CONT
008C	0087	008F	003C	007B	Current DATA line number
008E	0089	0091	003E	007D	Current DATA address
0090	008B	0093	0040	007F	Input vector
0092	008D	0095	0042	0081	Current variable name
0094	008F	0097	0044	0083	Current variable address
0096	0091	0099	0046	0085	Variable pointer for FOR/NEXT
0098	0093	009B	0048	0087	Start of work area, pointers, etc
00A1	009C	00A4	0051	0090	Jump vector for functions
00A4	009F	00A7	0054	0093	Misc numeric work area
00AE	00A9	00B1	005E	009D	Accum#1: Exponent
00AF	00AA	00B2	005F	009E	Accum#1: Mantissa
00B3	00AE	00B6	0063	00A2	Accum#1: Sign'
00B4	00AF	00B7	0064	00A3	Series evaluation constant pointer
00B5	00B0	00B8	0065	00A4	Accum#1 hi-ordeer (overflow)
00B6	00B1	00B9	0066	00A5	Accum#2: Exponent, etc.
00BC	00B7	00BF	006C	00AB	Sign comparison, Acc#1 vs #2
00BD	00B8	00C0	006D	00AC	Accum#1 lo-order (rounding)
00BE	00B9	00C1	006E	00AD	Series pointer
	00BB	00C3			Error jump
		00C6			SAVE jump
		00C9			LOAD jump
00C0	00BF	00CC	0070	00B1	CHRGET subroutine; get Basic char
00C6	00C5	00D2	0076	00B7	Sub entry: get prev character
00C7	00C6	00D3	0077	00B8	Basic pointer (within subrtn)

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RAMBLIN'

Roy O'Brien

HOW THE CB2 LINE WORKS...

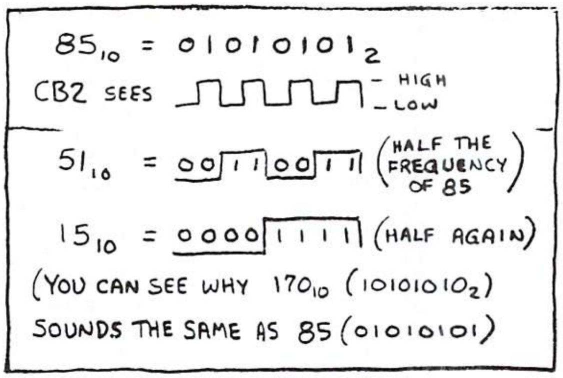
CB2 IS ONE CONNECTION (OF MANY), TO A SPECIAL CHIP IN THE PET CALLED THE VERSATILE INTERFACE ADAPTER (VIA), COMMODORE PART NUMBER 6522.

THE VIA APPEARS TO THE 6502 MICROPROCESSOR TO BE NOTHING MORE THAN A GROUP OF MEMORY ADDRESSES, NO DIFFERENT FROM ANY OTHER RAM REGISTERS; ACCEPTING AND RETURNING 8-BIT BINARY NUMBERS UNDER PROGRAM CONTROL. HOWEVER, INTERNAL CONTROL CIRCUITS IN THE VIA PERMIT A NUMBER OF NEAT THINGS TO HAPPEN.

FOR INSTANCE, VIA ADDRESS 59466 IS A SERIAL I/O SHIFT REGISTER. IF YOU PUT DECIMAL 85 IN IT...

(POKE 59466, 85)

... IT WILL THEN CONTAIN BINARY 01010101.



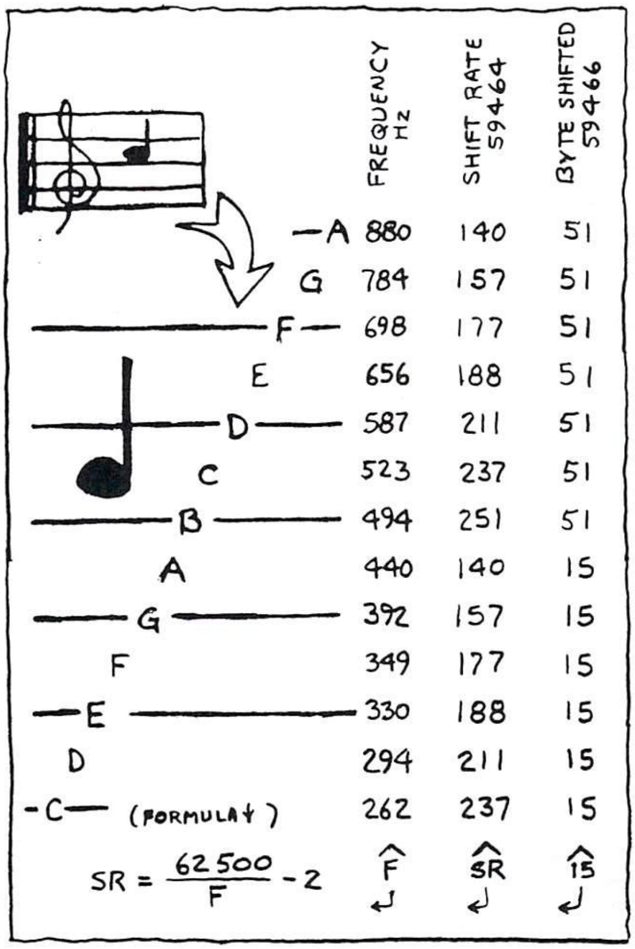
$85_{10} = 01010101_2$

CB2 SEES

$51_{10} = 00110011$ (HALF THE FREQUENCY OF 85)

$15_{10} = 00001111$ (HALF AGAIN)

(YOU CAN SEE WHY 170_{10} (10101010_2) SOUNDS THE SAME AS 85 (01010101)



	FREQUENCY Hz	SHIFT RATE 59464	BYTE SHIFTED 59466
A	880	140	51
G	784	157	51
F	698	177	51
E	656	188	51
D	587	211	51
C	523	237	51
B	494	251	51
A	440	140	15
G	392	157	15
F	349	177	15
E	330	188	15
D	294	211	15
C (FORMULA↓)	262	237	15
$SR = \frac{62500}{F} - 2$	$\hat{F}$ ↲	$\widehat{SR}$ ↲	$\widehat{15}$ ↲

NOW, IF YOU POKE VIA ADDRESS 59467 WITH 16, IT WILL SET UP A FREE-RUNNING CONDITION, IN WHICH THE BITS IN 59466 ARE SHIFTED OUT "ENDWISE" ONTO THE CB2 LINE WHICH, IN OUR EXAMPLE, WILL CAUSE CB2 TO GO ALTERNATELY HIGH AND LOW AS THE ONES AND ZEROS GO BY. YOU CAN HEAR THIS AS A TONE THROUGH AN AMPLIFIER HOOKED UP TO CB2.

WHAT PITCH? WELL, THAT DEPENDS ON WHAT NUMBER IS POKED INTO 59464, A VIA REGISTER WHICH KEEPS TRACK OF THE TIME. THE BIGGER THE NUMBER, THE LOWER THE PITCH.

-O'B ©

The Learning Lab

Marlene Pratto
Director of Educational Services
Small System Services, Inc.

Editor's Note:

Marlene Pratto is Director of Educational Services for Small System Services, Inc. One of her present assignments for COMPUTE. is supervision of a learning lab at COMPUTE.s "Educational Test Site": the Erwin Open School in Greensboro, North Carolina. We donate three and one/half hours of Marlene's time each week for work with the teachers and kids at Erwin. Beginning with this issue of COMPUTE., we'll share these experiences with our educational readers.

One of the biggest problems you'll face as an educator when the first microcomputer comes in the door is how to make it useful as quickly as possible. Microcomputers can and should be much more than the exclusive property of the local Mathematics department. The breadth of their capability allows creative utilization by students as soon as they learn minor aspects of the keyboard... regardless of age. We hope to share this and more in the issues ahead. Robert Lock.

At Erwin, as soon as the PETs arrived, children of all grades wanted to know what they could run; the teachers and aides of those children were asking the same thing. I went through the CURSOR magazines we had and made lists of games and programs we thought would be suitable for children in various grades. A list of these, with suggested grade levels and classifications, is found in the accompanying table. With this table, a teacher, aide or media specialist can quickly find an appropriate program for a child in any grade.

We started with CURSOR for several reasons. We were familiar with the quality of their software, and access to a full set of back issues gave us a wealth of programs to choose from. We were up and running the day the units arrived for less than $40.00 in initial software cost, with over seventy programs in our "library"! We can now spend more time gaining experience with the machines and how the children relate to them, while surveying the more structured commercially available software. Meanwhile, the students are already learning to write their own programs.

Logic and problem solving really go hand in hand, and it is sometimes difficult to classify a game as clearly one or the other. My "arbitrary" classification scheme is described below. If readers have comments or suggestions, please send them to COMPUTE. In March, **The Learning Lab** *will cover teacher training, and beginning programming for teachers.*

Explanation of Table Symbols:

HE: *Hand/Eye Coordination. Many CURSOR programs are "action" games involving quick manuvering of the keyboard in response to activity on the screen.*

DT: *Drill and/or tutorial*

L : *Logic Skills*

PS : *Problem Solving Skills*

F : *Fun and familiarity with the PET*

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Selected CURSOR Programs, Issues 1 through 12
Classified for Kindergarten through Eighth Grade

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K-2	WANDER	1					*
	BOP	4		*			
	FACE	5					*
	PAPER	7					*
	SLOT	9					*
	CANYON	12	*				
	FLIGHT	12					*
3-4	All of above						
	BRICK	1				*	
	SHARK	1	*			*	
	RACE	2	*			*	
	ZAP	2	*			*	
	DOTS	3				*	
	FLASH	3		*			
	HMAN	5		*			
	SHOOT	5	*				
	ADD	8		*			
	YAHTZEE	9				*	
	COURSE	10	*			*	
5-6	All of above						
	EST	2		*			
	MAD	2		*			
	GUESS	2			*		
	QUIX	3		*		*	
	HANOI	5			*	*	
	BSHIP	5				*	
	MIND	7			*	*	
	FBALL	7					*
	REVERS	8				*	
	DEMON	11	*				
	WIPEOUT	11				*	
	STATES	11		*			
	PICKUP	12	*				
7-8	All of the above						
	PLOT	1				*	*
	BAR	3				*	
	BOX	6			*	*	
	MAZE	8				*	
	TITRATE	10	*	*			
	PEG	11				*	

MICROS AND THE HANDICAPPED

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It was a bold and optimistic group that formed the Delmarva Computer Club in January of 1979, as a non-profit organization designed to meet these needs, especially when you consider we had no computer equipment, facilities, or money with which to accomplish our self-appointed mission. But this was indeed a dedicated group, and by June of 1979, an 8K PET computer was purchased by the Club with funds obtained through members canvassing for donations, through modest membership fees, but principally through no-interest loans made by several members to the Club.

The Club has about 25 members, including farmers, retirees, mathematicians, mechanics, artists, high school and college students, nurses, secretaries, teachers, businessmen, programmers, management assistants and directors, accountants, librarians, and therapists for the handicapped. Our first president was a blind student who learned to program the PET computer while he was a junior in high school. The Club publishes a monthly newsletter to keep members informed, since some members live almost 100 miles from each other in this very rural area. Meetings are held at least twice a month, with special demonstrations held as often as possible.

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If the members can't come to the computer, the ideal situation would seem to be for the computer to travel between member's residences, with tutorial tapes that could teach programming and the use of the computer. Unfortunately, this would at present violate the insurance policy the Club has on the computer.

We're still working on this dilemma of making the computer accessible to members without losing insurance protection. One possible solution under investigation is the use of modems and/or a remote CLUSTER ONE type system. This would give members 24-hr. computer availability without transportation expense, insurance violation, or the need to restrict meetings to building availability. We'll keep you posted on our progress.

Since several of the Club members are teachers in the same area school, the computer is currently kept at the school, either used by students and staff under a member's supervision or kept under lock and key. A beginning BASIC class is currently being taught after school to approximately 40 students and teachers at the school. In the Spring, a beginning class will be offered specifically for teachers, and an advanced class will be offered for those completing the beginning class. These classes are taught and supervised by Club members at no charge to the school or students. This activity helps to achieve the Club goal of bringing computer knowledge and computer accessibility to one segment of the community, with the added benefit of bringing new members into the Club. A start has also been made on the remaining goals, since, whenever possible, the Club demonstrates a variety of computer programs at the local libraries, and has donated to a local institution for the handicapped a computer program to teach the manual alphabet to the deaf and to people working with the deaf.

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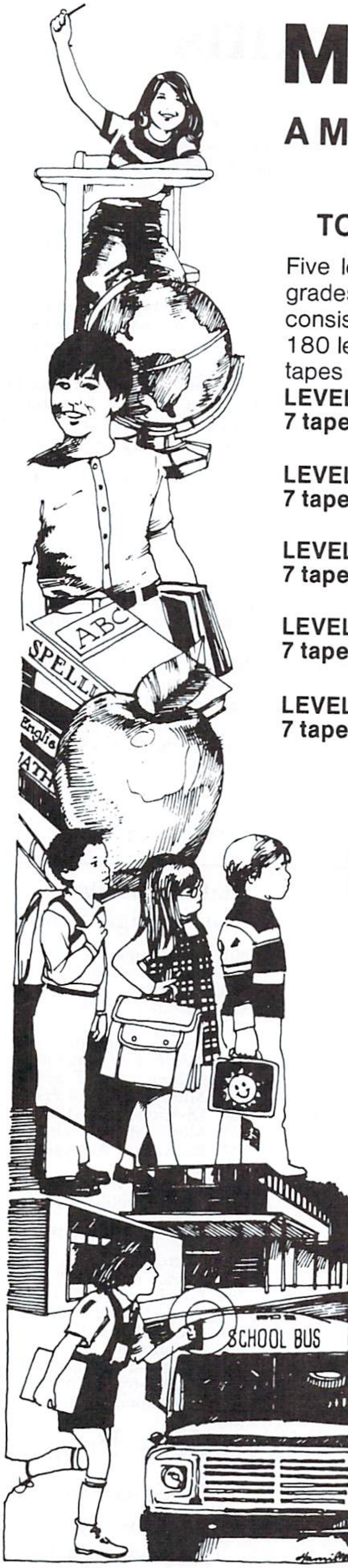
MICRO-ED *announces*

A Major Drill and Practice SPELLING SERIES for the PET®

TO SUPPLEMENT REGULAR CLASSROOM INSTRUCTION



Five levels—A, B, C, D, E—cover grades 2 through 6. Complete set consists of 35 tapes with a total of 180 lessons. Each level has seven tapes containing thirty-six lessons.

LEVEL A
7 tapes—36 lessons—grade 2
$49.95

LEVEL B
7 tapes—36 lessons—grade 3
$49.95

LEVEL C
7 tapes—36 lessons—grade 4
$49.95

LEVEL D
7 tapes—36 lessons—grade 5
$49.95

LEVEL E
7 tapes—36 lessons—grade 6
$49.95

Each lesson presents a group of words illustrating a particular pattern or rule. Typical patterns featured by these word-clusters include short vowels, long vowels, doubled consonants, consonant blends, silent consonants, *ed* and *ng* endings, *ing* endings, homonyms, contractions, prefixes, and suffixes.

You can save $24.00 by purchasing the entire series for $225.00.

Other programs now available include:

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Tape One: There-Their-They're
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For further information on these and other MICRO-ED programs, mail detachable MICRO-ED postcard in "Buyer's Guide"

PET is the registered trademark of Commodore Business Machines, Santa Clara, California.

USAGE BONERS
15 tapes—$99.00

This drill and practice series focuses on common mistakes in usage, such as agreement between subject and verb, double negatives, etc. The format employed is frequently used in standardized achievement tests.

MICRO-ED, INC.

P.O. Box 24156
Minneapolis, MN 55424

Software Specialists Science and Education

Microphys Programs

Dear Educator:

Microphys is pleased to introduce its series of computer programs which have been specifically designed for use on the Commodore 8K PET and 16/32K CBM microcomputers. These programs have readily enabled instructors to provide their students with an opportunity to review, in an interesting and effective manner, the important concepts encountered in introductory courses in chemistry, physics, mathematics, vocabulary, and spelling.

Please note that the vast array of software programs, which have been **uniquely** designed for use on the PET microcomputer, will readily enable you to use the microsystem in your courses as soon as it arrives. The programs are available on cassette tapes and arrive complete with full instructions for their immediate use even by those who have little, if any, experience with the use of the computer itself.

There are three types of programs in the Microphys series:

I. **Computer-Assisted Instruction Programs** guide the student through a series of quantitative questions; the student interacts with the computer and receives immediate evaluation of his responses and/or assistance when needed. Each time a particular program is run, a different set of numerical data is generated. In most instances, an entirely new problem is presented.

II. **Individualized-Instruction Programs** generate a unique set of problems for each student. The essential information needed to solve each problem is recorded and, when he is ready to do so, the student may obtain the computer's answers and compare his results. These answers may be suppressed by deleting line number 8500 in any program. When now run, a unique set of problems is produced for each student who records the essential information along with his code number which is generated by the computer. When his work is completed, the student enters his code number and answers into the program which had given him his assignment. The computer will then grade his work, displaying the answers to those problems which were incorrectly solved; a percent score and a brief comment reflecting an overall evaluation are also given.

III. **Utility Programs** are designed to provide solutions to time consuming problems often given on exams or homework assignments. Problems in calorimetry, stoichiometry, projective motion, vector analysis, etc. require tedious computation. These utility programs free teachers from the time required to obtain the correct solutions. Students may also be permitted access to these programs in order to check their own work.

Please note that each physics and chemistry program has both the computer-assisted instruction and individualized instruction versions recorded on opposite sides of the cassette. The vocabulary programs are similarly designed; the computer assistance being rendered by providing the student with a sentence in which the word to be defined is used properly. With this contextual clue, the student is again asked to correctly select the proper definition. The math cassettes have only an individualized-instruction mode.

Microphys has released its educational software on floppy diskettes designed for use on the Commodore 2040 dual drive floppy disk unit. Each diskette is accompanied by complete instructions for those programs recorded upon it. Write for details.

Microphys programs are available from local computer dealers. If your dealer does not carry the programs, you should encourage him to contact Microphys directly. You may of course order software directly from Microphys if programs are not obtainable locally.

An educational software catalogue, describing the nature of the various programs listed below, is available from Microphys. Please enclose 25 cents for postage and handling.

Note: Please indicate whether you desire the 8K or 16K version of a given program when placing an order.

The cost of each cassette is $20.

Chemistry and Physics Cassettes

1. Linear Kinematics
2. Projectile Motion*
3. Momentum and Energy*
4. Energy and the Inclined Plane
5. Inelastic Collisions
6. Centripetal Force
7. Pulley Systems — Machines*
8. Specific Heat Capacity
9. Calorimetry
10. Heats of Fusion/Vaporization
11. Specific Gas Laws
12. General Gas Law
13. Thermodynamics I
14. Thermodynamics II
15. Transverse Standing Waves
16. Longitudinal Standing Waves
17. Lenses and Mirrors*
18. Refraction of Light
19. Series Circuit Analysis
20. Parallel Circuit Analysis I

20A. Parallel Circuit Analysis II

21. Series/Parallel Circuit Analysis*
22. Faraday's Law
23. Gram-Molecular Mass
24. The Mole Concept*
25. The Molarity Concept*
26. The Normality Concept
27. The Molality Concept
28. Stoichiometry: Mass/Mass
29. Stoichiometry: Mass/Volume
30. Stoichiometry: General*
32. Percent Concentration
33. pH Concept
34. EMF of Electrochemical Cells
35. Electric Field Analysis
36. Photoelectric Effect
37. Symbols and Valence Drill
38. Formulas of Compounds Drill*
40. Total Internal Reflection

DEALER INQUIRIES INVITED

Vocabulary Cassettes

401. 12th Grade I
402. 12th Grade II
403. 12th Grade III
404. 12th Grade IV
405. 12th Grade V
406. 11th Grade I
407. 11th Grade II
408. 11th Grade III
409. 11th Grade IV
410. 11th Grade V
411. 10th Grade I
412. 10th Grade II
413. 10th Grade III
414. 10th Grade IV
415. 10th Grade V
416. 9th Grade I
417. 9th Grade II
418. 9th Grade III
419. 9th Grade IV
420. 9th Grade V
421. 8th Grade I
422. 8th Grade II
423. 8th Grade III
424. 8th Grade IV
425. 8th Grade V
426. 7th Grade I
427. 7th Grade II
428. 7th Grade III
429. 7th Grade IV
430. 7th Grade V

Spelling Cassettes

601. Spelling I Grade 12

602 Spelling II Grade 12
606 Spelling I Grade 11
607 Spelling II Grade 11
611 Spelling I Grade 10
612 Spelling II Grade 10
616 Spelling I Grade 9
617 Spelling II Grade 9
621 Spelling I Grade 8
622 Spelling II Grade 8
626 Spelling I Grade 7
627 Spelling II Grade 7

Math Cassettes Senior High School

701. Quadratic Equations
702. Trigonometry I
703. Simultaneous Equations (2x2)
704. Simultaneous Equations (3x3)
705. Geometrical Areas
706. Trigonometry II
707. Verbal Problems I — Numbers
708. Verbal Problems II — Coins
709. Verbal Problems III — Ages
710. Verbal Problems IV — Interest
711. Verbal Problems V — Mixtures
712. Verbal Problems VI — Geometry
713. Verbal Problems VII — Rates
714. Verbal Problems VIII — Digits
715. Verbal Problems IX — Work
716. Arithmetic Progressions I
717. Arithmetic Progressions II
718. Geometric Progressions I
719. Geometric Progressions II
720. Types of Variation
721. Linear Equations
722. Formula Evaluation
723. Coordinate Geometry I
724. Exponents and Logarithms
725. Verbal Problems — General

Math Cassettes Junior High School

801. Magic Squares
802. Multiplication
803. Division
804. Modular Arithmetic
805. Proportion Problems
806. Percent Problems
807. Addition of Fractions
808. Subtraction of Fractions
809. Multiplication of Fractions
810. Division of Fractions
811. Mode, Median, and Mean
812. Bar Graph Analysis
813. Decimals I
814. Decimals II
815. Verbal Problems I

Utility Cassettes

301. Vector Analysis I
302. Vector Analysis II
303. Gas Law Analysis
304. Optics Analysis
305. Projectile Analysis
306. Calorimetry Analysis
307. Chemistry I Analysis
308. Chemistry II Analysis
309. Stoichiometry Analysis

Microphys Programs

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Computer programs to use Morse Code as an audible output from the computer to the blind.

Computer programs to use vocal output for the blind or for students needing reinforcement in educational programs, through tape recorders, speech synthesizers, or a Texas Instrument's "Speak-and-Spell" interfaced to the computer.

Computer programs to use slide projectors, overhead transparencies, or video tape players connected to a computer to aid in educational programs. This will also enable the deaf to either communicate with the computer or through the computer to other people.

Computer programs to teach the braille alphabet to sighted and other individuals who may need to work with the blind. Also, development of an inexpensive system to teach braille to non-sighted individuals.

Development of a computerized emergency message system. For instance, an automatic phone call by the computer to a fire department when a smoke or fire detector is activated. This could aid handicapped people who may not be able to use the telephone, or for protection when someone is away from their home or business.

Are these and other goals beyond the grasp of the Delmarva Computer Club? Our members don't think so.

We will be exploring ideas and sharing insights with COMPUTE readers in coming issues, and welcome input from other interested groups or individuals on these and other projects. Why can't computer enthusiasts communicate as well as ham radio operators have over the years in helping themselves and others to solve problems of common interest? Please send correspondence to the Club secretary, Jean Trafford, P.O. Box 36, Wallops Island, Virginia 23337. **The Delmarva Computer Club**

"DON'T BOTHER ME, I'M LEARNING" SCHEDULED FOR BROADCAST ON THE PBS NETWORK.

One Pass, Inc. has announced that "Don't Bother Me, I'm Learning" will be shown over the Public Broadcasting Network on Sunday, January 6, 1980, at 6:00 p.m. This production will present a view of the microelectronic revolution and its impact on the learning process of children. This will be the first television special to concern itself with the subject of computer-based education of elementary school children from the acquisition of basic skills to playing fantasy games.

The San Francisco Bay Area was chosen as the locale for this production because it is recognized as being very active in the computer education field. "Don't Bother Me, I'm Learning" was taped at the Lawrence Hall of Science in Berkeley, at one public elementary school and two private schools in the San Francisco Bay Area, IBM Research, and at a futuristic home in Hillsborough, California.

Technical consultant for this production is Bob Albrecht, an author and lecturer, who was described in Time (February 20, 1978) as being "a pioneer in electronic education." "Don't Bother Me, I'm Learning" was produced by David Shepardson and directed by Karen Carlson. The executive producer is Steve Michelson. Major funding for this PBS broadcast has been provided by the Bell & Howell Corporation.

Educational Funding

In coming issues of COMPUTE, we'll explore various funding possibilities for acquiring and supporting microcomputer-based learning labs. If you're willing to sit down and write a two to three page note on the fine art of obtaining money for micros, I'd certainly like to see it.
Robert Lock

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PET PRODUCTS

Programs — Workbooks
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Dealer Inquiries Invited

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PROGRAMS	
SW-1*	**MAILB** mailing list system
SW-2*	**CHECKBOOK** record
SW-3*	**ACCOUNTS** keep track of who owes you how much
SW-4	**MEDIT** create and maintain data files
SW-5*	**CALENDAR** appointments, meetings at a glance

WORKBOOKS		
WB-1	**Getting Started with Your PET**	$3.95
WB-2	**PET String and Array Handling**	$3.95
WB-3	**PET Graphics**	$4.95
WB-4	**PET Cassette I/O**	$4.95
WB-5	**Miscellaneous PET Features**	$3.95
WB-6	**PET Control and Logic**	$3.95

*These programs are special purpose data base management systems. They all can:

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- Select based on range of entry number

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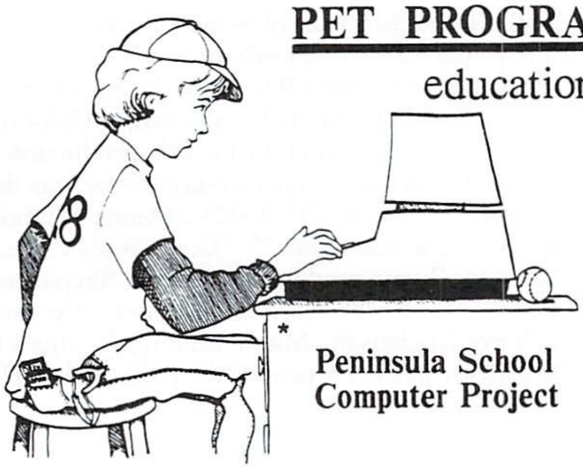
PET PROGRAM TAPES

educational software
for 8k pets



* Peninsula School Computer Project

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or Order Direct*

Tape 1: Pilot and five Pilot programs, $19.95

This tape contains an interpreter that lets the PET use the language PILOT. This language, optimized for programs with lots of dialog, was the subject of a feature article in the Fall 1979 issue of Compute. The additional programs (including a fine version of Hammurabi) not only have tremendous value in themselves, but act as models to help the user learn the PILOT language.

Tape 2: WSFN, Lemon, Kaleidoscope and Renumber, $14.95

For a one-tape offering, this one is hard to beat. There is something here for everybody! WSFN is not a radio station - it is a computer language which lets PET users create beautiful geometric figures and learn some valuable programmiing concepts at the same time. Lemon is a time-tested simulation of a lemonade stand with a very well done display of the daily transaction summary. Kaleidoscope brings us back to graphics, but this time the user just watches while the computer does the work! Renumber goes a long way towards remedying the lack of a REN statement in Commodore's BASIC.

Tape 3: Quest and Draw, $9.95

Quest is one of the finest basic adventure games for the PET and it will keep the player busy for a *long* time (we finally found a way out with the treasure, but *we* won't tell how to do it!) This program has triggered several imitations and was featured in Byte. It is a great challenge for a rainy evening. Draw, first featured in People's Computers magazine, was one of the first general graphics programs for the PET, and it is still one of the best. For just under $10, this tape is loaded with value.

***Peninsula School Computer Project**
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Menlo Park, CA 94025

After Christmas Buyers Guide
DEC. 26
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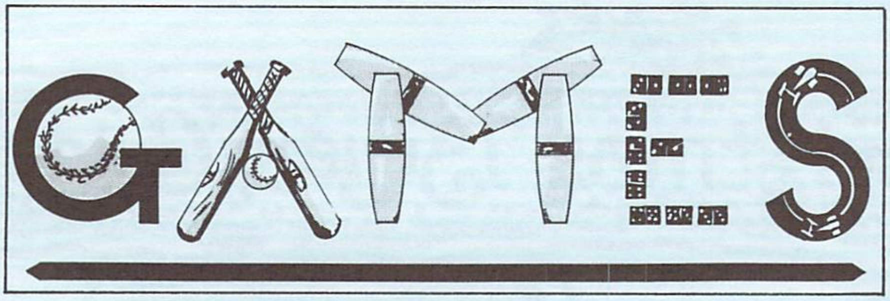

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TREK-X Command the Enterprise as you scour the quadrant for enemy warships. This package not only has superb graphics, but also includes programming for optional sound effects. A one-player game for the PET 8K. **Order No. 0032P $7.95.**

GOLF Without leaving the comfort of your chair, you can enjoy a computerized 18 holes of golf with a complete choice of clubs and shooting angles. You need never cancel this game because of rain. One or two players can enjoy this game on the Apple with Applesoft II and 20K. **Order No. 0018A $7.95.**

BOWLING/TRILOGY Enjoy two of America's favorite games transformed into programs for your Apple:
•**Bowling**—Up to four players can bowl while the Apple sets up the pins and keeps score. Requires Applesoft II.
•**Trilogy**—This program can be anything from a simple game of tic-tac-toe to an exercise in deductive logic. For one player.
This fun-filled package requires an Apple with 20K. **Order No. 0040A $7.95.**

TANGLE/SUPERTRAP These two programs require fast reflexes and a good eye for angles:
•**Tangle**—Make your opponent crash his line into an obstacle.
•**Supertrap**—This program is an advanced version of Tangle with many user control options.
Enjoy these exciting and graphically beautiful programs. For one or two players with an 8K PET. **Order No. 0029P $7.95.**

CHECKERS/BACCARAT Play two old favorites with your PET.
•**Checkers**—Let your PET be your ever-ready opponent in this computer-based checkers program.
•**Baccarat**—You have both Casino- and Blackjack-style games in this realistic program.
Your PET with 8K will offer challenging play anytime you want. **Order No. 0022P $7.95.**

CASINO I These two programs are so good, you can use them to check out and debug your own gambling system!
•**Roulette**—Pick your number and place your bet with the computer version of this casino game. For one player.
•**Blackjack**—Try out this version of the popular card game before you go out and risk your money on your own "surefire" system. For one player.
This package requires a PET with 8K. **Order No. 0014P $7.95.**

CASINO II This craps program is so good, it's the next best thing to being in Las Vegas or Atlantic City. It will not only play the game with you, but will also teach you how to play the odds and make the best bets. A one-player game, it requires a PET 8K. **Order No. 0015P $7.95.**

TURF AND TARGET Whether on the field or in the air, you'll have fun with the Turf and Target package. Included are:
•**Quarterback**—You're the quarterback as you try to get the pigskin over the goal line. You can pass, punt, hand off, and see the result of your play with the PET's superb graphics.
•**Soccer II**—Play the fast-action game of soccer with four playing options. The computer can play itself or a single player; two can play with computer assistance, or two can play without help.
•**Shoot**—You're the hunter as you try to shoot the bird out of the air. The PET will keep score.
•**Target**—Use the numeric keypad to shoot your puck into the home position as fast as you can.
To run and score, all you'll need is a PET with 8K. **Order No. 0097P $7.95.**

DUNGEON OF DEATH Battle evil demons, cast magic spells, and accumulate great wealth as you search for the Holy Grail. You'll have to descend into the Dungeon of Death and grope through the suffocating darkness. If you survive, glory and treasure are yours. For the PET 8K. **Order No. 0064P $7.95.**

PET DEMO I You can give yourself, your family, and your friends hours of fun and excitement with this gem of a package.
•**Slot Machine**—You won't be able to resist the enticing messages from this computerized one-armed bandit.
•**Chase**—You must find the black piece as you search through the ever-changing maze.
•**Flying Pheasant**—Try to shoot the flying pheasant on the wind.
•**Sitting Ducks**—Try to get your archer to shoot as many ducks as possible for a high score.
•**Craps**—It's Snake Eyes, Little Joe, or Boxcars as you roll the dice and try to make your point.
•**Gran Prix 2001**—Drivers with experience ranging from novice to professional will enjoy this multi-leveled race game.
•**Fox and Hounds**—It's you against the computer as your four hounds try to capture the computer's fox.
For true excitement, you'll need a PET 8K. **Order No. 0035P $7.95.**

PENNY ARCADE Enjoy this fun-filled package that's as much fun as a real penny arcade—at a fraction of the cost!
•**Poetry**—Compose free verse poetry on your computer.
•**Trap**—Control two moving lines at once and test your coordination.
•**Poker**—Play five-card draw poker and let your PET deal and keep score.
•**Solitaire**—Don't bother to deal, let your PET handle the cards in this "old favorite" card game.
•**Eat-Em-Ups**—Find out how many stars your Gobbler can eat up before the game is over.
These six programs require the PET with 8K. **Order No. 0044P $7.95.**

MIMIC Test your memory and reflexes with the five different versions of this game. You must match the sequence and location of signals displayed by your PET. This one-player program includes optional sound effects with the PET 8K. **Order No. 0039P $7.95.**

MIMIC (see description for the PET version 0039P) This package requires the Apple 24K. **Order No. 0025A $7.95.**

ARCADE I This package combines an exciting outdoor sport with one of America's most popular indoor sports:
•**Kite Fight**—It's a national sport in India. After you and a friend have spent several hours maneuvering your kites across the screen of your PET, you'll know why!
•**Pinball**—By far the finest use of the PET's exceptional graphics capabilities we've ever seen, and a heck of a lot of fun to boot.
Requires an 8K PET. **Order No. 0074P $7.95.**

ARCADE II One challenging memory game and two fast-paced action games make this one package the whole family will enjoy for some time to come. Package includes:
•**UFO**—Catch the elusive UFO before it hits the ground!
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•**Blockade**—A two-player game that combines strategy and fast reflexes.
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ACCOUNTING ASSISTANT This package will help any businessman solve many of those day-to-day financial problems. Included are:
•**Loan Amortization Schedule**—This program will give you a complete breakdown of any loan or investment. All you do is enter the principal amount, interest rate, term of the loan or investment, and the number of payments per year. You see a month-by-month list of the principal, interest, total amount paid, and the remaining balance.
•**Depreciation Schedule**—You can get a depreciation schedule using any one of the following methods: straight line, sum of years-digits, declining balance, units of production, or machine hours. Your computer will display a list of the item's lifespan, the annual depreciation, the accumulated depreciation, and the remaining book value. This package requires the PET 8K. **Order No. 0048P $7.95.**

ACCOUNTING ASSISTANT (see the description for the PET version 0048P) This package requires the Apple 16K. **Order No. 0088A $7.95.**

MORTGAGE WITH PREPAYMENT OPTION/FINANCIER These two programs will more than pay for themselves if you mortgage a home or make investments:

- **Mortgage with Prepayment Option**—Calculate mortgage payment schedules and save money with prepayments.
- **Financier**—Calculate which investment will pay you the most, figure annual depreciation, and compute the cost of borrowing, *easily and quickly*.

All you need to become a financial wizard with an 8K PET. **Order No. 0006P $7.95.**

MORTGAGE WITH PREPAYMENT OPTION/FINANCIER (see description for PET version 0006P) This package requires the Apple 16K. **Order No. 0094A $7.95.**

BASEBALL MANAGER This pair of programs will let you keep statistics on each of your players. Obtain batting, on-base, and fielding averages at the touch of a finger. Data can be easily stored on cassette tape for later comparison. All you need is a PET with 8K. **Order No. 0062P $14.95.**

Home and Personal

Our programs can't boil an egg or change a diaper, not yet. But they can help you solve many everyday problems.

DIGITAL CLOCK Don't let your PET sit idle when you are not programming—put it to work with these two unique and useful programs:

- **Digital Clock**—Turn you PET into an extremely accurate timepiece that you can use to display local time and time in distant zones, or as a split-time clock for up to nine different sporting events.
- **Moving Sign**—Let the world know what's on your mind. This program turns your PET into a flashing graphic display that will put your message across. **Order No. 0083P $7.95.**

DECORATOR'S ASSISTANT This integrated set of five programs will compute the amount of materials needed to redecorate any room, and their cost. All you do is enter the room dimensions, the number of windows and doors, and the base cost of the materials. These programs can handle wallpaper, paint, panelling, and carpeting, letting you compare the cost of different finishing materials. All you'll need is a PET 8K. **Order No. 0104P $7.95.**

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- **Biorhythms**—Find out when your critical days are for physical, emotional, and intellectual cycles.

You'll need only a PET with 8K memory. **Order No. 0005P $7.95.**

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MATH TUTOR I Parents, teachers, students, now you can turn your Apple computer into a mathematics tutor. Your children or students can begin to enjoy their math lessons with these programs:

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All programs have varying levels of difficulty. All you need is Applesoft II with your Apple II 24K. **Order No. 0073A $7.95**

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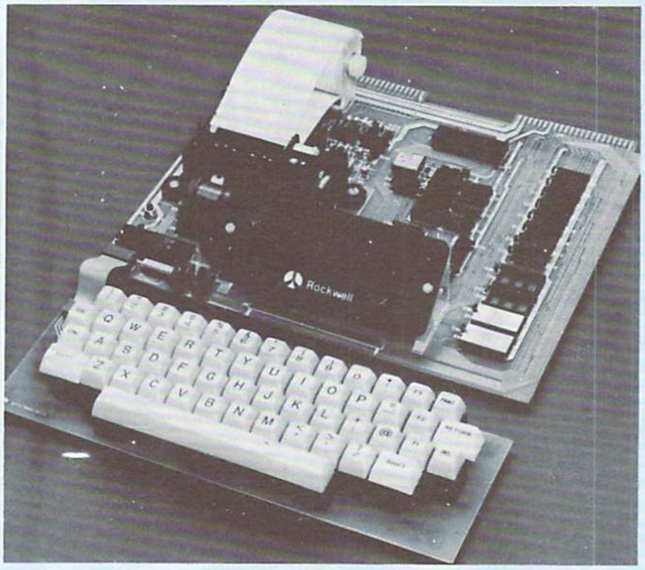

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AIM 65 features on-board thermal printer and alphanumeric display, and a terminal-style keyboard. It has an addressing capability up to 65K bytes, and comes with a user-dedicated 1K or 4K RAM. Two installed 4K ROMS hold a powerful Advanced Interface Monitor program, and three spare sockets are included to expand on-board ROM or PROM up to 20K bytes.

An Application Connector provides for attaching a TTY and one or two audio cassette recorders, and gives external access to the user-dedicated general purpose I/O lines.

Also included as standard are a comprehensive AIM 65 User's Manual, a handy pocket reference card, an R6500 Hardware Manual, an R6500 Programming Manual and an AIM 65 schematic.

AIM 65 is packaged on two compact modules. The circuit module is 12 inches wide and 10 inches long, the keyboard module is 12 inches wide and 4 inches long. They are connected by a detachable cable.

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- Two R6522 Versatile Interface Adapter (VIA) devices, which support AIM 65 and user functions. Each VIA has two parallel and one serial 8-bit, bidirectional I/O ports, two 2-bit peripheral handshake control lines and two fully-programmable 16-bit interval timer/event counters.

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- Both connectors are KIM-1 compatible

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PET SOFTWARE

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Comes completely assembled with volume control and edge connector. Just plug into the User Port on your PET $19.95

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Plays music from the PET keyboard or from DATA Statements. Requires Tone Oscillator above . . . . $ 7.95

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Let your PET teach you the Morse Code required for a Ham Radio license. Sends random letter groups or letters input from the keyboard. Speed variable from 3 to 25 WPM. Requires Tone Oscillator above . . . . $ 7.95

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Play against the PET. PET plays a good, fast game according to International Checker Rules. Excellent graphics show the board and all checkers. Watch your PET move his man around the board. Clock shows elapsed time for each move. . . . . $ 7.95

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11. **Othello:**
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An excellent version of this favorite card game. All cards are shown using PET's excellent graphics. The PET plays a cool logical game difficult to beat even for the best players. . . . . $ 7.95

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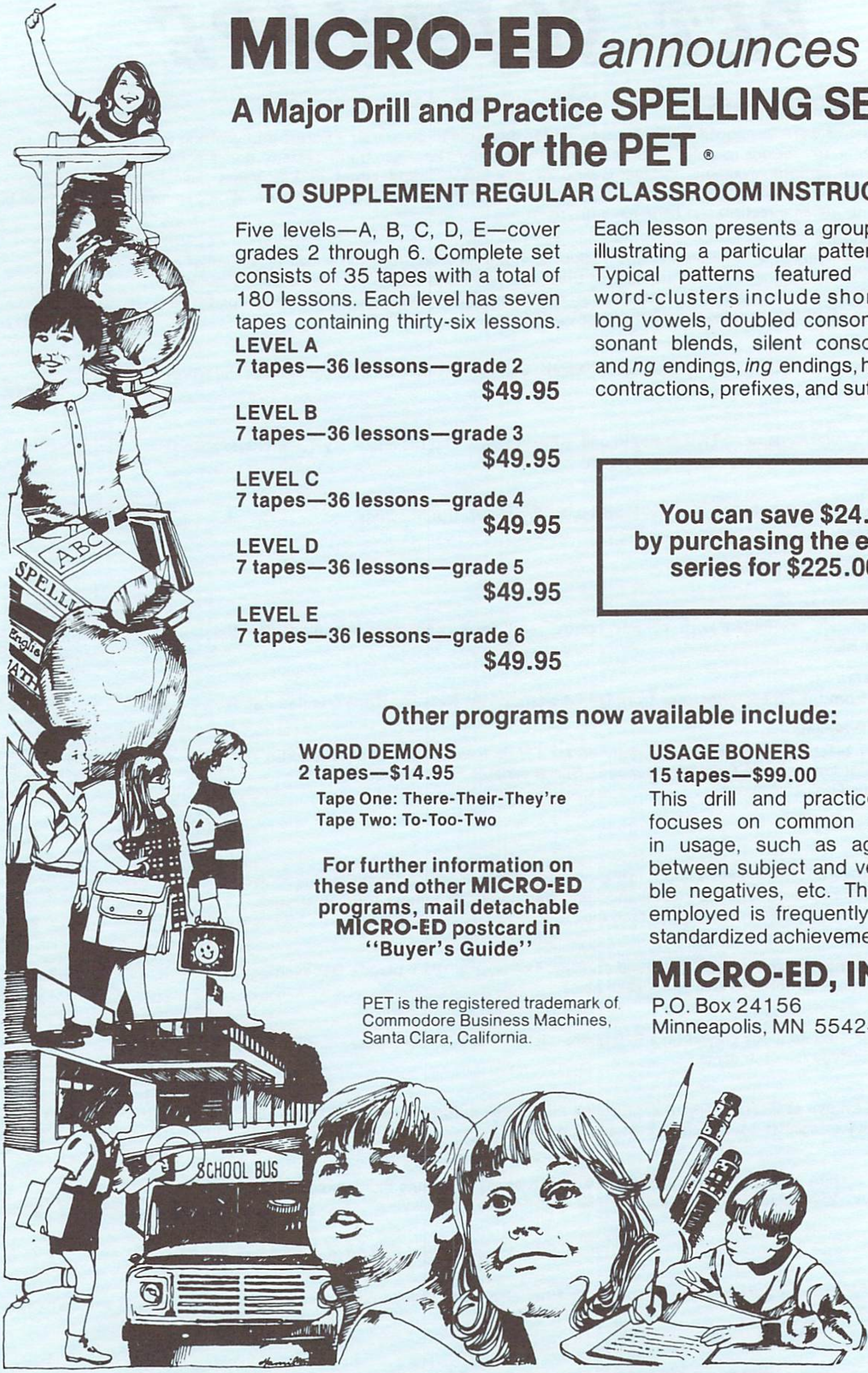

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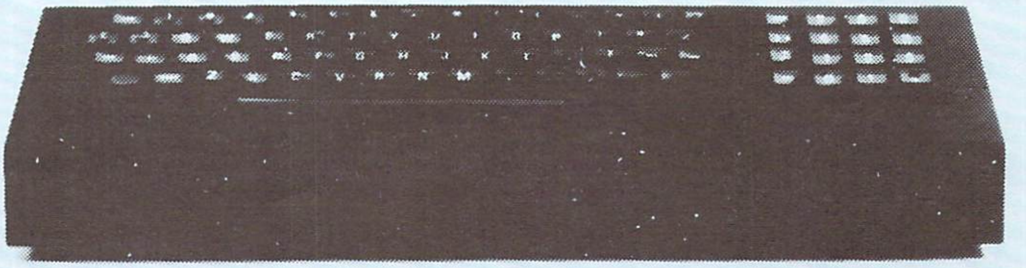

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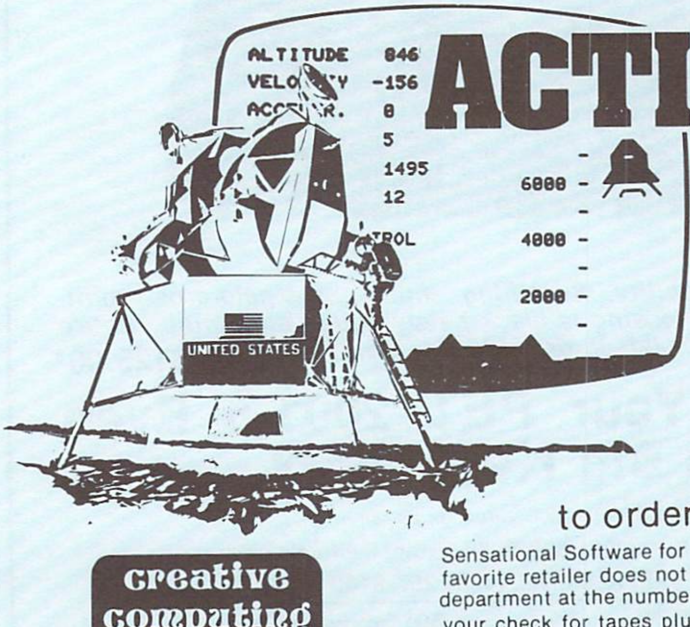

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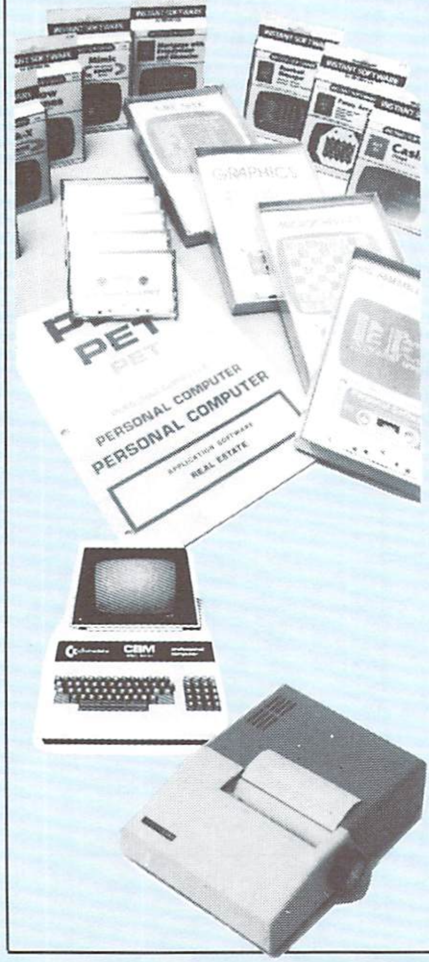

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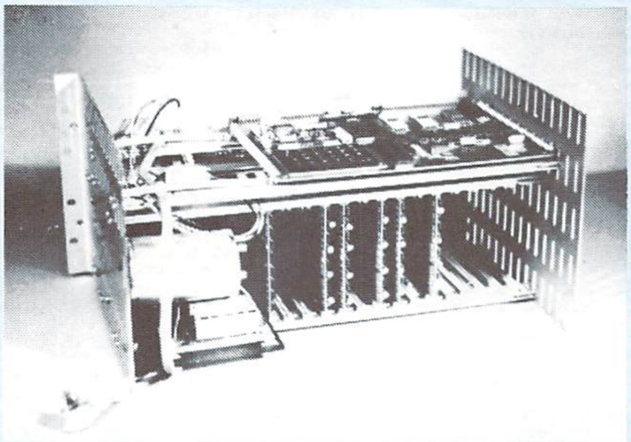

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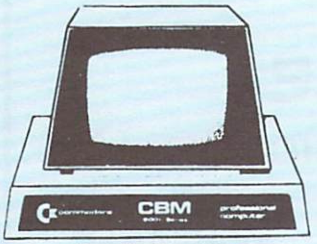

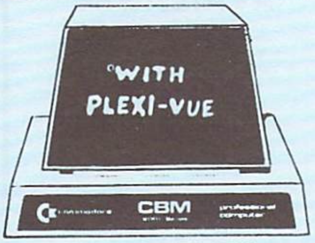

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"Accounting Pack I by SAWYER SOFTWARE can be described in one word: Fantastic. Any who has prepared a balance sheet manually will have a slight heart murmur upon using the Accounting Pack. It is amazing that the program fits in 8K. I would say the Accounting Pack is useful and could justify the price of a PET unto itself for any small business."
Review in BEST OF PET GAZETTE.

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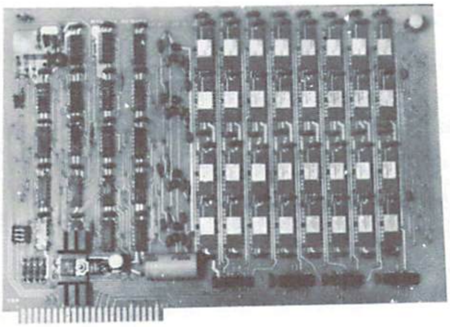

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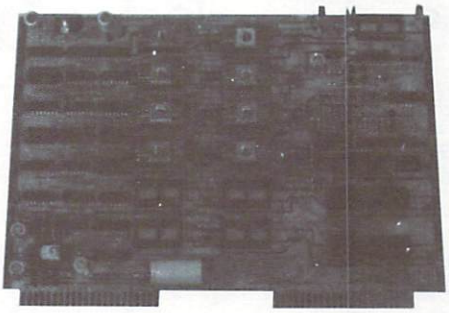

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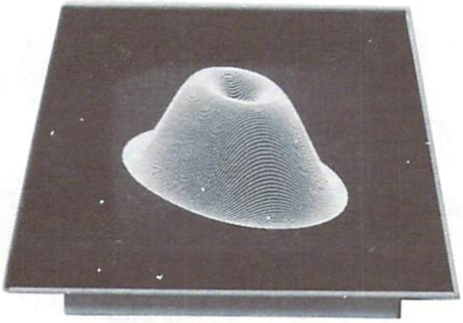

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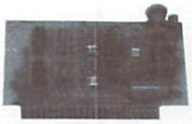

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THE apple® GAZETTE

SOFTSELL ASSOCIATES (2022-79th Street, Brooklyn, N.Y. 11214) has announced an Applesoft tape verification program. According to Softsell, a major drawback of the Apple computer is its lack of a verify capability for Applesoft programs that have been saved out on tape. Now, with a new program from Softsell Associates, this problem can be eliminated. Once run, the Applesoft Tape Verifier will provide either an Apple II or an Apple II Plus computer with the ability to verify programs saved to cassette. The program remains resident in the computer as long as power is applied and the computer is in the Applesoft mode.

In addition to working on both types of Apple computers, the Applesoft Tape Verifier also works with both RAM or ROM Applesoft. The program costs $20 and is supplied on an Apple compatible cassette.

Dealer inquiries are invited.

Apple Authors

We know you're out there. COMPUTE wants the Apple Gazette to enjoy a long and happy life. We need your input! Send articles, reviews, news items, and club notes to: Apple Coordinator, COMPUTE, Post Office Box 5119, Greensboro, NC 27403

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We read with interest the review by Michael Tulloch, "D. C. Hayes Micromodem $395.00", and appreciate the favorable review given by him.

The product reviewed was the MICROMODEM II™ which is supplied with our FCC registered MICROCOUPLER™. We also produce a modem for S-100 systems which is called the MICROMODEM 100™. The product names MICROMODEM II, MICROMODEM 100 and MICROCOUPLER are trademarks of D. C. Hayes Associates, Inc. In the future please acknowledge our trademarks as you do for Commodore, Apple and Atair. Also please note that our company name is D. C. Hayes Associates, Inc. and refer to the company by its proper name.

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I wish you the best with your new publication and look forward to reading the next issue.

Sincerely,
D. C. HAYES ASSOCIATES, INC.
Dennis C. Hayes
President
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Summagraphics Corporation, a leading manufacturer of Data Tablets/Digitizers, has announced receipt of a large order from Apple Computer, Inc. for Bit Pad One™ Digitizers.

The Bit Pad One Digitizers will be used with Apple II computers for entering graphic data--allowing educators, business people, artists, scientists and others to create circuit designs, original art, and other graphic applications.

For more information, contact Summagraphics, P.O. Box 781, Fairfield, CONN 06430

A Printer for the Apple: The Heath H14

Don Earnhardt
2130 Nettlebrook Drive
Winston-Salem, NC 27106

Most hobbists find it difficult to fit the desired microcomputer system into a budget already suffering from terminal inflation. As a result, one must search for the best prices available and occasionally make compromises in terms of capabilities and features in order to complete the system. Additionally, it is usually necessary to purchase components and peripherals on a piecemeal basis. This provides the ability to spread the cost over a longer time period without finance charges.

With new and at times less costly equipment being introduced almost daily, the piecemeal purchasing plan allows one to choose from a wider variety of components as time passes. However, the question of system compatibility must be the utmost consideration. This question has played a major part in the completion of my own system.

When the time finally arrived for me to purchase a printer for my Apple II® , I had many things to consider. Did I need letter quality? Would I be satisfied with an electrostatic? What would be the minimum acceptable printing speed? Did I need a tractor-feed, friction-feed, or both? Which printer could be readily interfaced with the Apple? And finally, where could I get the most printer for my money?

It was about this time that I began to notice reviews of the Heath H14 in many microcomputer-related magazines. All of these reviews suggested that the H14 kits could possibly be one of the better buys on the market. But would it be comparable? It is advertised as an RS-232 printer acceptable characters in ASCII form and having a data transfer rate of up to 4800 baud. After reading all of the specs in the Heath catalog, I decided that this particular printer could suit my needs - provided it could be successfully interfaced to the Apple II.

Upon placing the order for the H14, the search began for an RS-232 interface. I settled on the serial I/O interface sold for $42.00 by Electronic Systems. P. O. Box 21638, San Jose, CA 95151. The decision was based mainly on the fact that this interface was designed specifically for the Apple. It also came in kit form, thus providing an additional cost advantage.

The RS-232 interface kit arrived in little more than a week and was completed in about 30 minutes. I found that this board was generally well designed. The only shortcoming was the fact that a capacitor in the clock circuit must be soldered, removed, and replaced to change the baud rate. The capacitor supplied with the kit is a .1 MFD which selects a baud rate of 110 (10 characters per second). This is a much slower rate than I had desired, but it is acceptable for purposes of testing the interface and the printer since handshaking is not necessary at this rate.

I was fortunate in that I was able to borrow an RS-232 printer with which to test the interface board and the accompanying software. First, I ran the baud-rate adjustment program which repetitively displays the current baud rate on the video monitor. As the trim-pot on the interface board is adjusted, the display changes to reflect the new baud rate. The baud-rate adjustment program is quite useful, but I was not as pleased with the output program supplied. After writing my own output program, it became clear that the RS-232 interface would work quite well at 110 baud.

After several notices of shipping date postponements, the Heath H14 finally arrived. It was difficult to suppress my anxiety in order to do a thorough job of building, double checking, and testing as recommended in the assembly manual. However, I knew that the recommended construction method could save much time in the long run.

Upon applying power to the printer, I checked all the paper transport features (form-feed, paper advance, and paper reverse). All of them worked as described in the manual. Next, I tested the print mechanism by pressing the test button located on the main circuit board of the printer. The printer zipped across the page, leaving a trail of perfect characters. After verifying that the narrow characters would print correctly, it was time for the most important test.

The H14 was connected to the Apple via the Electronic Systems RS-232 interface. Upon getting into BASIC, a short program was loaded into RAM and the printer output program was activated. I typed the word LIST and H14 began to print the program just as it appeared on the screen. It worked beautifully.

The next step was to increase the baud rate. Three things had to be accomplished in order to do this. The capacitor on the interface board had to be replaced, the new board had to be adjusted, and the handshaking arrangements had to be made.

I selected a 10075 MFD capacitor for 1200 baud, installed it, and utilized the baud-rate adjustment program to make the final adjustments.

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The Apple Joystick is a quality crafted dynamic interactive I/O device engineered specifically for the apple computer. The stick comes completely wired for paddles 0 & 1 and switches 0, 1 & 2. Among the excellent features of the stick are auto-centering, which positions the stick in the center of its range whenever the handle is released, and positive action switches with tactile feel and audible feedback.

The stick assembly itself is a precision molded unit originally designed for the ultimate in smooth linear proportional control required for international radio-control model competition.

The heart of the stick centers around two cermet resistive elements with bifurcated wiper contacts, which provide the smooth continuous change in resistance not found in wire-wound elements.

As an added bonus, all game I/O connections are brought out and terminated in the cabinet. This feature facilitates modification and/or implementation of all game I/O functions, such as, (example: annunciators, sound, paddles 2 and 3). Using Gesu's double I/O extender cable and two joysticks (one modified for paddles 2 and 3) two player joystick games can be implemented.

Normally no adjustment is required upon installation of the stick in your Apple computer. However, if it should become necessary to adjust the centering, mechanical adjustment tabs are provided inside the stick cabinet.

Refer to the Apple II reference manual for directions on how to install the stick in your computer.

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The single model consists of one foot of cable, one 16-pin male and one 16-pin female connector. The extender plugs into the game I/O and the female end if secured to the outside of the cabinet with the double-backed mounting tape provided. Installed in this fashion the extender eliminates the necessity of opening the apple computer to install or remove the stick or any other game device.

The double model is exactly the same as the single model with the addition of a second 16-pin female connector. This extender has the same advantages as the single extender plus allowing two sticks or game I/O devices to be installed simultaneously. Note: When two games I/O devices are installed simultaneously make sure no conflicts exist betwen paddle assignments. Only one device should be assigned to each paddle.

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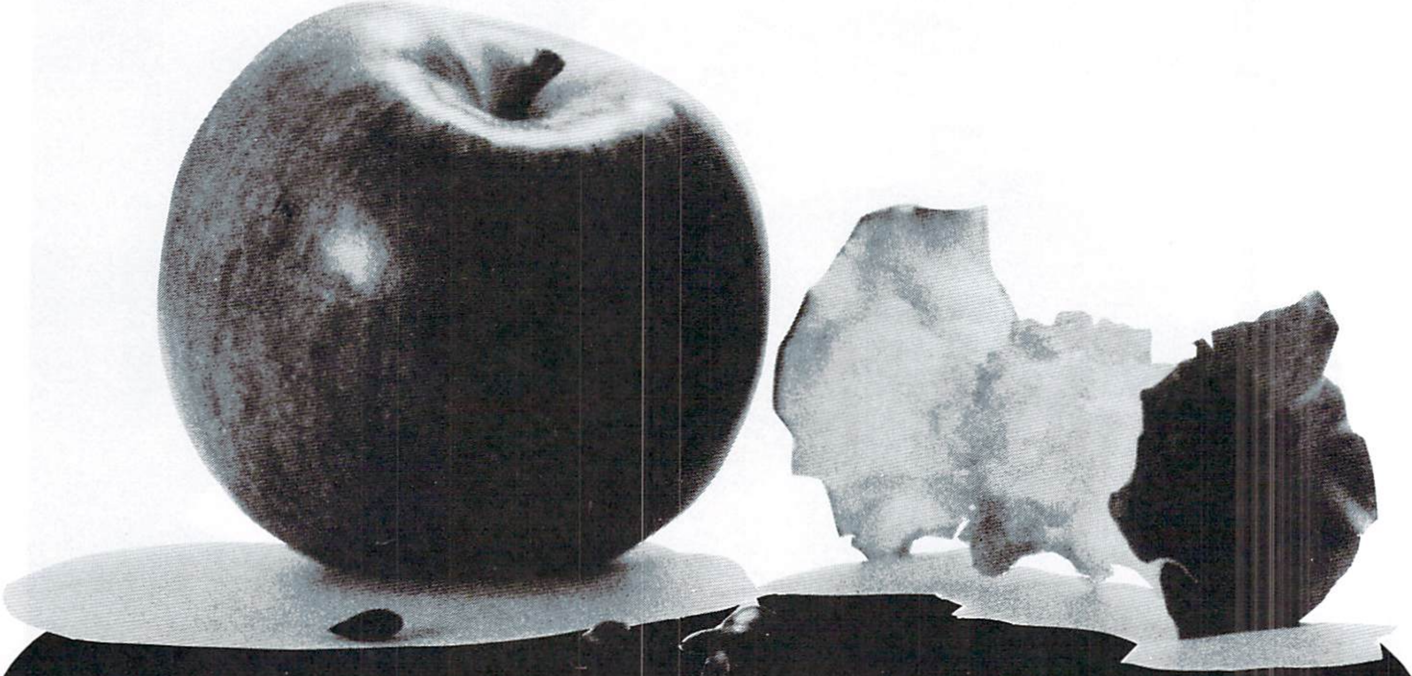

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This proved to be no problem, but the handshaking was another matter.

The interface board provides a data terminal ready (DTR) lead which is normally used to indicate that power has been supplied to a modem. The printer provides a request-to-send (RTS) lead that indicates when the printer line buffer is ready to accept characters. Also, the printer sends a CONTROL Q and CONTROL S to the computer via the RS-232 input to provide handshaking capability through software.

I felt that the software handshaking method would be the easiest and less time-consuming. All that was needed was to add a loop in my output program to monitor the status of the RS-232 input port. As long as the control Q was being received (control Q indicates that the printer is busy), it would be safe to continue sending characters. This proved to be correct, and the printer operated very well at 1200 baud.

The output program is shown in Figure 1. To link this program to the Apple system software, the address of the START label ($0317) is first entered in the Apple monitor output registers ($36 and $37). Then the first character to be printed is saved on the stack and a JSR to $FDF0 sent to the video is performed to output the character to the Apple video. After returning from this routine, the WAIT1 loop monitors the RS-232 input (for I/O slot 0 on the Apple board, this address is $C080). If a control S (#$13) is present, the printer is indicating that it cannot accept any more characters. If control Q (#$11) is present, the printer buffer is not yet full. But before sending a character, the status of the UART transmit buffer ($C081) must be checked to verify that the UART is ready to accept characters. When the UART is ready, the character previously saved is pulled off the stack and sent to the UART for transmission. The EXIT label provides a return so that another character can be retrieved for processing. When it is desired to turn off the printer, the program resets the monitor output registers to transmit characters only to the video display.

The program can be accessed through the jump table or by going directly to the BON label (30CG from the monitor or call 780 from BASIC). Also the jump table may be used to turn off the printer or the BOFF label may be accessed directly (336G or call 822).

I feel that the H14 is a good choice for Apple owners who are on a tight budget but would like to have a fast dot matrix type printer. Heath Kits and documentation are always good and the fact that troubleshooting information is provided could mean a savings in time and money if trouble should ever occur.

```
                   0010              .OS
                   0020              .BA $300
0300- 4C 41 03     0030              JMP MON
0303- 4C 45 03     0040              JMP MOFF
0306- 4C 0C 03     0050              JMP BON
0309- 4C 36 03     0060              JMP BOFF
030C- A9 17        0070 BON          LDA #$17
030E- 8D 36 00     0080              STA $36
0311- A9 03        0090              LDA #$03
0313- 8D 37 00     0100              STA $37
0316- 60           0110              RTS
0317- 48           0120 START        PHA
0318- 20 F0 FD     0130              JSR $FDF0
031B- AD 80 C0     0140 WAIT1        LDA $C080
031E- C9 11        0150              CMP #$11
0320- D0 F9        0160              BNE WAIT1
0322- AD 81 C0     0170 WAIT2        LDA $C081
0325- 6A           0180              ROR A
0326- 90 FA        0190              BCC WAIT2
0328- 68           0200              PLA
0329- 8D 82 C0     0210              STA $C082
032C- C9 8D        0220              CMP #$8D
032E- D0 05        0230              BNE EXIT
0330- A9 0A        0240              LDA #$0A
0332- 4C 17 03     0250              JMP START
0335- 60           0260 EXIT         RTS
0336- A9 F0        0270 BOFF         LDA #$F0
0338- 8D 36 00     0280              STA $36
033B- A9 FD        0290              LDA #$FD
033D- 8D 37 00     0300              STA $37
0340- 60           0310              RTS
0341- 20 0C 03     0320 MON          JSR'BON
0344- 00           0330              BRK
0345- 20 36 03     0340 MOFF         JSR BOFF
0348- 00           0350              BRK
                   0360              .EN
```

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THE ATARI® GAZETTE

Atari Basic and PET Microsoft Basic

A Basic Comparison

Joretta Klepfer COMPUTE Staff

An important item to consider when shopping for a computer is the language that you will use to communicate. You need to decide what features are important for your application and examine the language accordingly. The brand new Atari computers offer yet another version of BASIC to tempt programmers and soon-to-be programmers. The following table is a comparison of the Atari BASIC (not Microsoft) language and the PET (Microsoft) BASIC language. I have indicated various features in each and then commented about the PET and Atari treatment or lack of treatment of that feature.

The table is not an exhaustive treatment of either language but should assist you in learning the "basics" about both languages. The references used to determine the contents of the table are listed at the end of this article. You will also want to consult the manuals provided with the various computer peripherals to learn more about communication with these devices.

Two sources of information for the Atari BASIC language are provided with the computers: *Atari BASIC* by Albrecht, Finkel, and Brown and *BASIC REFERENCE MANUAL* (400-800) by Shaw and Brewster. I would like to share some thoughts with you about each one. Let's start with *Atari BASIC.*

The message on the binding indicates that *Atari BASIC* is "A Self-Teaching Guide" and the design of the book is well suited to accomplish that goal. The format uses proven teaching techniques. Each chapter begins with the instructional goals for that section and indicates what your skill levels should be when you finish it. The material is organized into numbered sections called frames, each of which presents information and then quizzes you about it. An important part of the learning process is the active participation on your part in answering the questions (without peeking at the answers) and writing the programs that are requested. By all means, turn your Atari on, if you have one, and use it in conjunction with the book. Another nice feature is the self-test at the end of each chapter and at the end of the book. Answers are given to all the questions but you will learn more if you take the tests without referring to them. This book is designed to teach BASIC to a novice and, if used properly, will accomplish this task very well.

Atari BASIC is not a reference book however, and BASIC programmers will grow frustrated trying to use it to learn about the Atari brand of BASIC. A welcome addition to the book would be a categorized appendix which lists the Atari BASIC commands, statements, arithmetic and logical operators, special symbols, and variable naming conventions. (The built-in functions are already listed in the appendix, along with the ASCII character codes and error messages.) This type of "quick reference" section would also assist those who use this book to learn BASIC as they may need to refresh their memory from time to time.

The authors indicate in their message "To The Readers" that the BASIC in your new Atari computer may be more advanced than the 8K Atari BASIC they used in writing this book. This comment is an important one and means that you should read carefully all the manuals you receive with your unit to determine what refinements, if any, have been made. I am aware of at least one: *Atari BASIC* indicates that a variable name may be a single letter or a letter and a number, whereas the BASIC REFERENCE MANUAL gives you freedom to create variable names of any length up to 120 characters so long as they begin with a letter. This difference should not create a lack of confidence in *Atari BASIC,* for the variable naming conventions given by Albrecht and company are probably best for beginners and are obviously still valid.

Atari BASIC does not include advanced programming techniques and applications such as creating and manipulating data files. You will also not find information on saving and loading programs on cassette or disk; refer to the special operator's manuals for I/O information on these peripherals.

If you would like to learn Atari BASIC, *Atari BASIC* is an excellent place to start and I highly recommend it. If you already know BASIC and want to learn the idiosyncrasies of the Atari brand, read on!

I have been reading a preliminary draft of the new *BASIC REFERENCE MANUAL* which will be shipped with the Atari computers upon its completion. This book is designed in a more traditional manner, presenting information interspersed with examples. Be sure to start by reading the preface and the flowchart of the program for using the manual. Chapter 1 gives a general introduction to the manual and it's terminology and notation conventions. A lengthy list of abbreviations is given which you'll refer to frequently as you read through the manual.

The book is written in a friendly, non-threatening manner using a style that explains the BASIC language features in a very ''readable'', straightforward way. One very nice feature of the style of text presentation is that the general format of a statement is presented first and then an example is given. For the most part liberal use of visual aids such as flowcharts, diagrams, tables, and examples will assist you in your search for facts.

I believe that one or two sections will cause some difficulty to the beginning programmer, however. One of these is the section on Input/Output Operations. Dealing with the general format of the OPEN statement is not a trivial exercise and since the book is aimed at all levels of readers, a different treatment of this complex subject would be easier for the newer ''computerists'' to grasp. The section on game controller functions has no examples longer than one line and very little information about the use of these functions. We are told that the ''imaginative programmer will think of many uses'' for these functions. Help! Atari - I'm not very imaginative and others might not be also; in the final manual please give us some ideas on how to use these unique functions.

I was pleased to find so many useful items in the appendices. There are several user programs and sample routines listed. A directory of BASIC keywords gives not only the keyword and a brief summary, but also gives the chapter number if you need further reference. A very necessary listing is included of error messages and their corresponding numbers. Utility listings of Decimal to Hexadecimal conversion tables, and the ATASCII character set as well as PEEK and POKE information assist the serious programmer. A listing of trigonometric functions derived from the built-in functions should interest the scientific programmer. The section on the keyboard and editing features is a good introduction to this input device. It was an excellent idea to include as an appendix the glossary and chapter index of the words in the glossary, however I feel this addition should in no way replace a regular index. Hopefully, one will be included in the final edition.

Let me restate that all the comments I have made about the *BASIC REFERENCE MANUAL* came from examining a rough draft of the document. I look forward to reading the final copy. I have confidence that this manual will provide new Atari owners with ready access to their brand of BASIC.

REFERENCES:

1. Bob Albrecht, Leroy Finkel, Jerald R. Brown. **Atari BASIC.** John Wiley & Sons, Inc., New York (1979)
2. Carol Shaw, Keith Brewster. **BASIC REFERENCE MANUAL.** draft, Atari, Inc., Sunnyvale, CA (1979)
3. **CBM User Manual,** First Edition. Commodore Business Machines, Santa Clara, CA (1979)
4. **Atari 400 Operators Manual.** Atari, Inc., Sunnyvale, CA (1979)
5. **Atari 800 Operators Manual.** Atari, Inc., Sunnyvale, CA (1979)

Microsoft Pet Basic
Atari Basic (in italics)

Variable names

Two alphanumeric characters form unique variable names, however, for ease of reading, up to 5 alphanumeric characters may be used. If all characters are numeric except the first one the variable name length is limited by line length only. Integer variables are created by adding % to the name. String variables are created by adding $ to the name.

Variable names may be any length given memory limitations and must start with a letter. 128 different variables are allowed in a single program.

the cursor the specified number of spaces, indicate the POSition of the cursor, give the number of FREe bytes left in memory, pass a parameter to a USeR machine language program, and communicate with the PET clock. Functions may be nested.

Standard trigonometric and arithmetic functions, FRE, and PEEK are the same as PET. In addition there are CLOG for base 10 logs, ADR to return decimal memory address of specified string, DEG, RAD to specify either degrees or radians for this functions. Tab operations are accomplished by keystroke combinations.

Standard string functions are available, as well as special functions to designate substrings. The + symbol is used as the concatenation operator.

Same as PET but no functions for substringing. Substrings are formed by using subscripts with the string variable name to indicate characters in the string.

Graphics capabilities

Graphics symbols are accessed by pressing the shift key and the appropriate key (printed on the front of the keys on the PETs with graphic-style keyboards). These symbols may be used in PRINT statements to create displays on the screen. Graphic displays may also be created by using the POKE statement to insert graphic symbols into the screen memory.

Atari provides special keywords to make creating graphic displays much easier, such as PLOT, DRAWTO, POSITION, FILL (XIO 18), POKE, and GRAPHIC. There are nine different graphic modes: three for text only giving normal, double wide, and double size characters; three modes with split screen & lots of colors; two with split screen and only two colors; and one high resolution mode.

Color capabilities

No color capability

Special keywords are provided to create color displays, such as COLOR which selects one of four color registers, and SETCOLOR to specify the hue and luminance of each color register. By using a combination of 16 hues and 8 luminance settings over 100 colors can be created.

Sound capabilities

Sound is achieved by using the POKE statement to cause signals to be sent to the parallel user port which is attached an external device to produce sound. Rythm is controlled by using timing loops. Non-Commodore products are available for the PET to produce four-voice music similar to the Atari.

Atari provides a SOUND statement which allows specification of voice, pitch, distortion, and volume. Four voices can be played at the same time. Control of distortion creates interesting sound effects. Rythm is controlled by timing loops. The sound is heard through a speaker in the TV monitor.

Game I/O

No special statements or functions are available to aid in game interaction.

Four functions are provided for ease in programming paddle and joystick control. They are PADDLE and STICK to control movement, and PTRIG and STRIG to control the trigger button.

Files

Files must be OPENed before use with parameters specifying logical file number, device number, secondary address (permits intelligent peripherals to operate in any number of modes), and file name (for tapes name may be up to 128 characters). The CLOSE statement is used to close a file and need only the logical file number as parameter. PRINT#, INPUT#, GET# are used with tape or disk file I/O. Tape files are recorded twice with two different frequencies to aid in checking for errors.

Files must be OPENed before use with parameters specifying logical file number, type of operation (read, write, both), file name (8 characters or less) and device type. PRINT#, INPUT#, PUT#, GET# may be used for I/O operations. NOTE and POINT are functions provided to facilitate creation of random access files.

Commands

In addition to the standard commands of NEW, LIST, RUN, CONT, LOAD, SAVE, and POKE, the PET has a VERIFY command to allow tape files to be verified before erasing memory, and a CMD command to keep the IEEE-488 Bus actively listening. The LOAD and SAVE commands may include a file name.

Atari commands are the same as PET except that Atari has no VERIFY and CMD commands and file names may not be used with the CLOAD and CSAVE commands. Program files are located on the tape by means of the counter on the cassette.

Error correction & editing

You may erase characters or an entire line while typing. Later editing of programs is possible by cursor control and line deletion, by typing the line number and RETURN. Duplication of lines is possible by first LISTing the line, changing the line number, and pressing RETURN.

Same as PET

Error messages

For syntax errors only the line number is given, not the cause of the error. For execution errors, the error message and line number is printed on the screen.

Syntax errors are indicated by printing the line and showing the error in reverse video. Execution errors will cause a message to appear on the screen giving you a error message number to look up in your manual.

COMPUTE NEEDS YOU!

THE OUCH IN ATARI BASIC

by Glen Fisher and Ron Jeffries
The Code Works

After using the Atari 800 for a couple of months, we have found its version of Basic to be less than perfect. Please don't misunderstand; we think that the Atari is a great machine, and is very useable in spite of these faults. (Other computers will have an equally long list of defects, they will just be different defects.)

Essentially, there are no character strings in Atari basic. Instead, you have arrays of characters, which ain't the same thing! (On the good side, however, you are not limited to 255 character strings as in Microsoft Basic.)

Would you believe there are no error messages? Well, unless you consider ERROR 9 to be an error message. . . (It means "Subscript out of range").

There is not a DELETE command. True, few of the competing Basics have this essential feature, either. But hope springs eternal.

Atari doesn't have user defined functions (such as DEF FNA(X)). This is one of those things you don't miss until you need it, but when you need it you really need it!

Would you believe - there is not a TAB function? This is essential when you need to produce neatly formatted output.

AND and OR do not allow you to get at individual bits of a number. (We see you yawning! but this is more important than you might suspect, especially when dealing with PEEKs and POKEs.)

Unlike some of Atari's competitors, the Atari does not, repeat NOT, have any "typeahead". Typeahead allows you to give commands before previous commands finish, which is very nice when you want to quickly give a series of commands.

As best we can tell, there is no way to verify a saved file to see that it got saved properly. Of all the things to omit. . .

The GET statement has an interesting "feature": it waits until there is a character available. It would be far more convenient if it returned a special "no data yet" value.

There is a clock in the Atari, but you, Dear Reader, don't get easy access to it. There are Basics that give you clock values in two flavors: as "ticks" since the machine was turned on, and as time of day measured from when the machine was turned on.

Although you can have long, meaningful variable names (all of whose characters are significant, as opposed to lesser Basics that only use the first two characters), there is a problem! Variable names can not contain keywords. For example, POINTS and SCORE are both illegal. (This from a company known for its games!)

You can't list an open-ended line range. So, you have to say! LIST 500,32767 when what you want to do is list everything from line 500 on. Sigh!

The INPUT statement doesn't allow a prompt string. You have to first PRINT the prompt, then do the INPUT. Sure, you can live with it, but it's a pain.

Here's one for the books: in Atari Basic you can't READ or INPUT a value into an array element! (You guessed it: you first READ into an ordinary variable, then assign that variable to the array element. I hope that somebody on the design team at least has a guilty conscience.)

You can only have four colors on the screen at once. (The Apple has a minimum of six.)

The BREAK key should turn off sound. (It is nice that typing END will do so, however.)

Obviously, this list represents what we know as of late November, 1979 when this was written. To the best of our knowledge, all of the problems are real. We won't be surprised if some of these flaws are corrected by Atari. (We may also have misunderstood the preliminary manuals.)

Finally, if you feel that we are really "down" on the Atari, please realize that none of the problems mentioned here are serious enough to keep us from publishing our Atari software product. Despite its flaws, the Atari is a very useful and flexible personal computer.

John Victor, President
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Greenwich, CT 06830

ATARI BASIC

Part 2 of a Continuing Series

There is no question that the Atari graphics and other machine features make it superior to its predecessors as a personal computer. But these great features would be worth little if programmers could not readily take advantage of them. Atari BASIC makes the use of color graphics and the generation of sound incredibly easy.

A good example of what can be done with Atari BASIC can be found in the December issue of INTERFACE AGE. Al Baker of the Image Producers wrote a short version of the game of SIMON for the Atari 400 (using about 80 instructions). The game used color graphics and musical chords. The player attempts in this game to duplicate a series of notes and colors made by the computer in ever increasing lengths, and his or her entries are made by pushing a joystick. All of the versions of this game that I have seen on other computers have involved some machine language kluges to make them work, but this Atari program is done entirely in BASIC. The only thing here that might give the novice programmer some difficulties is the mathematical relationships of musical notes in a chord. Otherwise, the program is a model of simplicity.

Although Atari BASIC is not Microsoft BASIC, it is pretty much like the BASICs found on Apple, PET, and the TRS-80. The BASIC interpreter resides in a 10K ROM cartridge that plugs into a slot in the front of the Atari 400 or 800. (Both computers use the same BASIC.) Its floating point software computes to 9 place accuracy, it supports multiple statement lines, and it contains the usual compliment of library routines. Its execution speed appears to be a bit slower than Applesoft's, but it seems to be better than TRS-80 Level II. If the BASIC has any deficiencies, it is in the area of string handling logic. It does not support string arrays.

In some ways the BASIC resembles Apple's integer BASIC. This is particularly noticeable to Apple programmers when the computer enters the graphics modes and finds an area at the bottom of the screen with 4 lines of text. Atari Basic also allows the programmer to use variables in GOTO and GOSUB statements (i.e. GOTO A). In addition, the variables can be words, (i.e. GOSUB ERRORROUTINE, GOTO CHOICE, etc.), where CHOICE, for example, has a line number as a value.

There is one incredible innovation here that makes Atari BASIC unique. ANY WORD CAN BE USED AS A VARIABLE-- EVEN SO-CALLED 'FORBIDDEN' WORDS! The programmer could use the word END or LIST as a variable. This is definitely not allowed in any other version of BASIC. LIST can also be used as a program statement to make the listing of the resident program print out during the running of the program.

Here are some examples of the use of words as variables in Atari BASIC. Note that if a program command is going to be used as a variable, the word LET must preceed it when setting its value.

```
10 LET LISTING = 1000 :
LET ERRORCOUNT = 2000 :
LET CHOICE = 3000
. .
. .
120 IF ANSWER$ = CORRECT$
THEN RETURN
130 GOTO CHOICE
. .
. .
```

Various graphics modes can be entered by giving the graphics instruction along with a number. Most of these will have an area at the bottom of the screen for 4 lines of text. The programmer can eliminate this area by adding 16 to the number of the graphics mode. For example, GRAPHICS 3 has 4 lines of text, but GRAPHICS 3 + 16 does not. The graphics instruction will clear the screen. This can also be deactivated by adding 32 to the graphics mode number (i.e. GRAPHICS 35 enters GRAPHICS 3 without clearing the screen.)

The following is a brief description of some of the GRAPHICS modes.

GRAPHICS 0

This is the regular text mode for BASIC. The user gets 24 lines of 40 characters, where the characters can be upper or lower case, regular or reversed. In addition, the user can access, by pressing the CONTROL key, a set of pseudo graphics from the keyboard. These special characters can be used to draw pictures (very much like the special characters found on the PET).

The user has the ability to change the background color using the SETCOLOR instruction. The user can change the color designated by color register 2 (which controls background color) with the following instruction: SETCOLOR 2,4,14. The screen will turn light pink, since color register 2 contains the number 4 for red and the number 14 for the luminescence (0 for darkest to 14 for lightest).

In GRAPHICS 0 the user cannot mix the color of the type, which can only be a darker or lighter version of the background color. By setting color register 1 with a luminescence of 0, we get a dark type against a light background. SETCOLOR 1,0,14 plus SETCOLOR 2,0,0 will produce a dark grey background with light characters. Using the luminescences, the user has his or her choice of about 120 different shades of colors.

GRAPHICS 1 and GRAPHICS 2

These are the "large type" modes, with GRAPHICS 2 producing the largest type. In this mode the characters can be put on the screen in a variety of ways-- they can be PLOTted on like graphics, or PRINTed on. Different color characters can be made by defining the characters as upper case, lower case, or reversed characters. When the type appears on the screen, it appears as all capitals, but the color of the characters is different. A word printed as lower case may appear on the screen as upper case red characters, while a word printed as reverse capitals may appear as blue. For example, PRINT #6; "BLUE green" produces 2 "all-capital" words in 2 different colors.

GRAPHICS 3 to GRAPHICS 11

These are the real graphics modes where the computer PLOTs points at a given screen location. GRAPHICS 3 has the largest points, and the size goes down as the mode number increases. GRAPHICS 11 is a high resolution mode. The color of the points is taken from the color register indicated by the user. COLOR 3 tells the computer to make the point the same color as specified in color register 3.

To make plotting easier, the graphics modes use a DRAWTO instruction which will automatically plot a line from any given point to any other point on the screen, even if the line is a diagonal. There is also a technique to fill in a predetermined area of the screen to make a square of a specific color.

SOUND

The user has a choice of 4 sound generators which can be used to produce sounds or musical tones. The sound generators can also be used simultaneously to make chords. Once turned on, each sound generator stays on until the program reaches an END statement or the program shuts it off. SOUND 0, 121, 10, 8 plays middle C on sound register 0.

CONTROL CHARACTERS

Screen and cursor control functions can be put in a BASIC program in PRINT statements as control characters. If the user wants to clear the screen he or she can press the Clear Screen key. This can also be done in the program by making a PRINT statement and then pressing the ESCAPE key. When the user hits the Clear Screen key, a special control character is printed. When the program is run and the PRINT statement is executed, the screen will be cleared. The statement will appear like this: PRINT "↑".

EDITING AND ERROR MESSAGES

The screen editor on the Atari is the best I've seen. On the Apple, for example, the user cannot move type around the editor field, but on the Atari this can be done with simple keyboard inputs. The user does not need to worry about hidden errors, or relisting since all changes are immediately visible. If the user is making a line too long, a bell rings as a warning (just as it does on a typewriter).

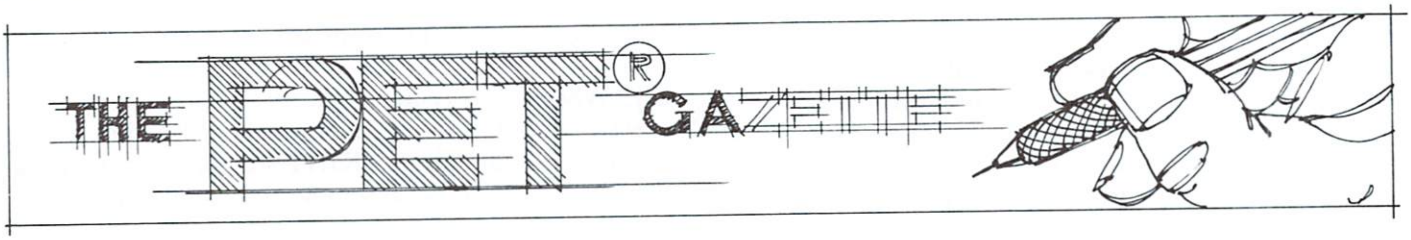
If a syntax error is made while entering or editing a line, the BASIC interpreter gives an immediate error message at the carriage return. This saves quite a bit of debugging time when entering a program. Unfortunately, for errors encountered during a program run, the user gets a numbered error message that must be checked in the manual. There are several of these messages so that they are not going to be easily memorized.

COMPUTER 1/0

In order to get FCC approval for the computer (so that it could be plugged into a regular TV set) Atari had to get approval for all of its peripheral devices at the same time. So the computer and its peripherals were designed as one package. This is reflected in the ease of access to peripherals from the BASIC. There are specific instructions to access disk, joysticks, printers and the cassette machine directly from BASIC. In addition to these, the user can define peripherals using an OPEN instruction. For example: OPEN #2, 8, 0, "C:" opens the cassette machine for special operations. The cassette player is now specified by #2. PUT #2, A outputs the value of A to the cassette player. The user can use INPUT, PRINT, GET, PUT, etc. as 1/0 instructions to peripherals.

BASIC can also treat the video screen and the keyboard as 1/0 devices for certain kinds of operations.

Atari Basic, like any other version of BASIC, suffers from some deficiencies when considering it for some special application. However, in the area of graphics and manipulation of text displays, this version of BASIC is; in my opinion, hands down superior to Apple, PET or TRS-80 BASIC. Its functions are complex, but the user will find the BASIC relatively easy to use compared to doing the same functions in some other form of BASIC.



Editor's Note: Last Minute Updates...

Heard from the west coast... stringy floppy is coming for the PET. More next time. PET SHACK is introducing an interface to tie the Radio Shack printer (the one that sells for $220 - $230) to the PET. The interface is expected to sell for around $80 when completed. We had a prototype in-house for review this issue but couldn't get our hands on a Radio Shack printer in time.

Two reviews next issue of Innovision's Presto-Digitizer... I've seen it and it works.

More PET storage: a major manufacturer of Winchester disk drives will be announcing their PET version sometime during the early Spring. Watch your March-April COMPUTE for a full rundown. ©

Computer Programs and Your Ethics

Robert Lock

I have high regard for the Cassette magazines CURSOR(PET) and IRIDIS(ATARI) published by Ron Jeffries and crew at The Code Works. While IRIDIS is not yet off the duplicator, CURSOR is now in its fourteenth issue, each providing creative, resourceful software at bottom of the line prices. Reprinted below is an excerpt from "Notes for Cursor 14" by Ron Jeffries. I'm a personal computer user, and am responding to his questions. The topics are of concern to us all in some form or other, and I'd like to see your feedback start coming in.

COMPUTER PROGRAMS AND YOUR ETHICS

Each month Cursor brings you a new tape of programs for the Pet. As you know, our philosophy has been that good software that is reasonably priced will not be stolen or "ripped off" to any great extent. We have deliberately priced our product as low as possible, thinking that most people are honest, and will not make copies for their friends. We have gotten some really nice mail from people who appreciate our policy, and who are respecting our rights to not have our programs copied. To the majority of our subscribers we want to say "Thanks for your support!". We are sorry to say, however, that there is some pretty good evidence that a significant number of people are not being fair to us about copying our product.

I'd like to explain some background that may help you understand our concerns about software theft. First of all, we are not a volunteer club. We purchase programs submitted to us by subscribers, and we also write programs ourselves. Work submitted to us is often extensively edited, and sometimes completely rewritten. We have a modest office, and of course some Pet computers and peripherals used to produce the magazine. There is a significant amount of clerical work to produce and ship each issue, to fulfill back issue orders, and to maintain the mailing list. (You wouldn't believe how often people move!) What I am saying is that the people who produce Cursor expect to be paid for their work, just as you are paid for your job. (Which is not a surprise, I hope.) Volume is very important to us: it costs a great deal to produce the first tape each month. It is only when our subscription base is quite high that we realize any profit at all.

A special problem is that there are a few "user groups" who are "sharing" commercial software. Please realize that there are also many Pet user groups that are very careful to avoid "swapping" commercial software. Computers are fun, and I think that user groups are extremely valuable to Pet owners as a way to share information and software written by the members. Please raise the issue of protecting commercial software at the next meeting of your user group.

So what does this all mean? The personal computer user - you - should realize that software is a product that costs money to produce, and that when you make a copy for a friend, you are hurting yourself and other users, as well as the vendor. In the case of Cursor, we have published source code that you are able to study and modify. One option, (which we don't especially like), is to use one of several protection schemes so that it is not possible to copy or even look at our programs. We hope that we don't have to do that, as we think that it would make Cursor less attractive to many of our users. From time to time we wonder whether the ripoff factor is so great that we are just stupid to continue producing a consumer product. (Software sold to corporations is much less vulnerable, as it is sold or leased under a license agreement, and the majority of firms are not willing to risk a lawsuit just to save a few dollars.) I would appreciate two things! First, please drop me a postcard (unsigned if you like) telling me your opinions on software ripoff, especially how much you think Cursor is illegally *copied. Second, please tell a friend or two about us. Word of mouth advertising is remarkably effective, especially from a satisfied user.*

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Ron: First of all, I think there's a scale of "ripping-off" of software that's obviously affected by things like packaging and cost. I think another factor is "perceived value". One factor in packaging is documentation. DUNJONQUEST, from Automated Simulations, sells for $24.95. . . that might seem a bit high for a personal game, and I suspect it is copied to some extent. But I doubt that it is plagarised in quantity because it comes with very nice, useful and necessary documentation. The "Game Manual" is lengthly and convenient in size (for keeping beside your PET). Dr. Daley's current package of 50 programs for $50-$60 (depending on storage media) is well packaged and documented and at a price of approximately $1.00 per program, quite cost effective. Cursor falls into a moderately different category. It comes with documentation built-in. So (except for the additional documentation contained in CURSOR notes), it lends itself to copying in some ways. I've talked to readers/users of CURSOR who admit they've been known to copy software ("sharing" it among themselves)... their "reasons": Expense is usually the first to be brought up. Naturally (?) the more expensive the program is, the more likely it is that it will be copied. The rationalization is that the software is overpriced and therefore it's okay to copy it. There is a point of diminishing returns in there somewhere... if you're trying to make a living selling software, and basing your prices on sales, and sales decline (partially due to copying), you'll raise prices.

Copying will increase, your sales will decline still further, and eventually you'll be out of business. At this point copying will cease... and another source of potentially creative software will have died out. I'm hopeful this won't be the case with CURSOR. The expense argument mentioned before has not been mentioned (at least in my presence) regarding CURSOR... the latest comment I heard was that each of the individuals wanted their own copy of an original. Not only a reflection of the quality of the magazine, but a reflection of your prompt attention to, and replacement of, damaged or defective tapes. I think this is the approach that you should maintain. CURSOR is attractively priced. Every person I know who gets CURSOR is so tuned in to its arrival each issue that I generally hear within two days of the arrival of a new CURSOR. I think that's the kind of product our industry needs more of.

Ron, you commented on protecting your cassettes... I vote no. My first adventure with sound from a PET came via spending an enjoyable afternoon "fiddling" with the data statements in one of your musical programs. That's an important aspect of the "learning" part of CURSOR, and I'm sure many people would hate to see it go.

Cordially, Robert

The bottom line: don't copy proprietary software. If it's not worth buying, then you should be able to do without it. If it is worth buying, then support its producers so they can turn out more of the same. I think that's really the crux of the whole issue. My advice? If you're currently getting "hot" copies of CURSOR, give it up. There's a handy ad at the bottom of the page with full details on going straight.

(Post Script: In putting together this issue, I realize that CURSOR is mentioned frequently. Here; again in Len Lindsay's column; and extensively in the new educational resource column written by Marlene Pratto. It's not "push CURSOR" month... the references are all independent. At this moment, I'm the only one who knows about the substantial overlap, and my preceeding notes were written first. Rather than go back and cut things out, I'm leaving them: an accidental overlap of positive thoughts on a positive product. RCL)

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The Programmer's Corner

Robert Lock, Editor
Larry Isaacs, COMPUTE Staff

Each issue, with the help of Larry Isaacs of our staff, I'll be putting together the Programmer's Corner. This issue, we're starting the one for PET. We hope to have have similar " Corners " built into the other Gazettes as soon as possible. The Atari version will begin in March-April, and if you Apple and OSI and other SBC owners will get rolling, we'll have yours too!

Program Listings for COMPUTE

Some brief suggestions:

1. Limit physical line length to 38 characters. You'll notice that many of our "reconstructed" program listings don't necessarily conform to the best of programming standards. We've chosen to err in the direction of readability, so occasionally you'll see a line of your well written program expand into several lines.
2. Use the following set of symbols, where possible, as we and Len and Jim Butterfield have done this time:

```
10 REM GRAPHICS AND CURSOR CONTROL
20 REM CHARACTERS WILL BE INCLOSED
30 REM IN BRACKETS,IE [ ].
40 REM
50 REM CURSOR POSITIONING
70 REM SP = SPACE(S)
80 REM UP = UP CURSOR
90 REM DN = DOWN CURSOR
100 REM LC = LEFT CURSOR
110 REM RC = RIGHT CURSOR
120 REM CLR = CLEAR SCREEN
130 REM HM = HOME CURSOR
140 REM
150 REM IF SPACE PERMITS, THESE
160 REM CHARACTERS MAY BE WRITTEN OUT
170 REM
180 REM GRAPHICS CHARACTERS WILL BE
190 REM INDICATED BY A CHARACTER
200 REM WITHIN QUOTES. THE CHARACTER
210 REM WILL BE THE ALPHANUMERIC ON
220 REM THE KEY WHICH GENERATES THE
230 REM GRAPHIC CHARACTER.
240 REM SOME GRAPHICS CHARACTERS CAN'T
250 REM BE REACHED DIRECTLY ON A CBM
260 REM KEYBOARD, SUCH AS ["$"].
270 REM THESE MAY BE INCLUDED IN YOUR
280 REM PROGRAM BY ASSIGNING THE
290 REM GRAPHICS CHARACTER TO A STRING
300 REM VARIABLE AND USING THAT
310 REM INSTEAD.
320 REM FOR EXAMPLE, YOU MIGHT USE
330 REM G$=CHR$(ASC("$")+128) TO
340 REM DEFINE THE CHARACTER.
350 REM OR, YOU MIGHT USE A SIMILAR
360 REM STATEMENT TO PRINT THE
370 REM CHARACTER ON THE SCREEN AND
380 REM EDIT THE REST OF THE BASIC
390 REM STATEMENT AROUND IT.
```

In many of our program listings you'll find a set of trailing REM statements that explain the special notation.

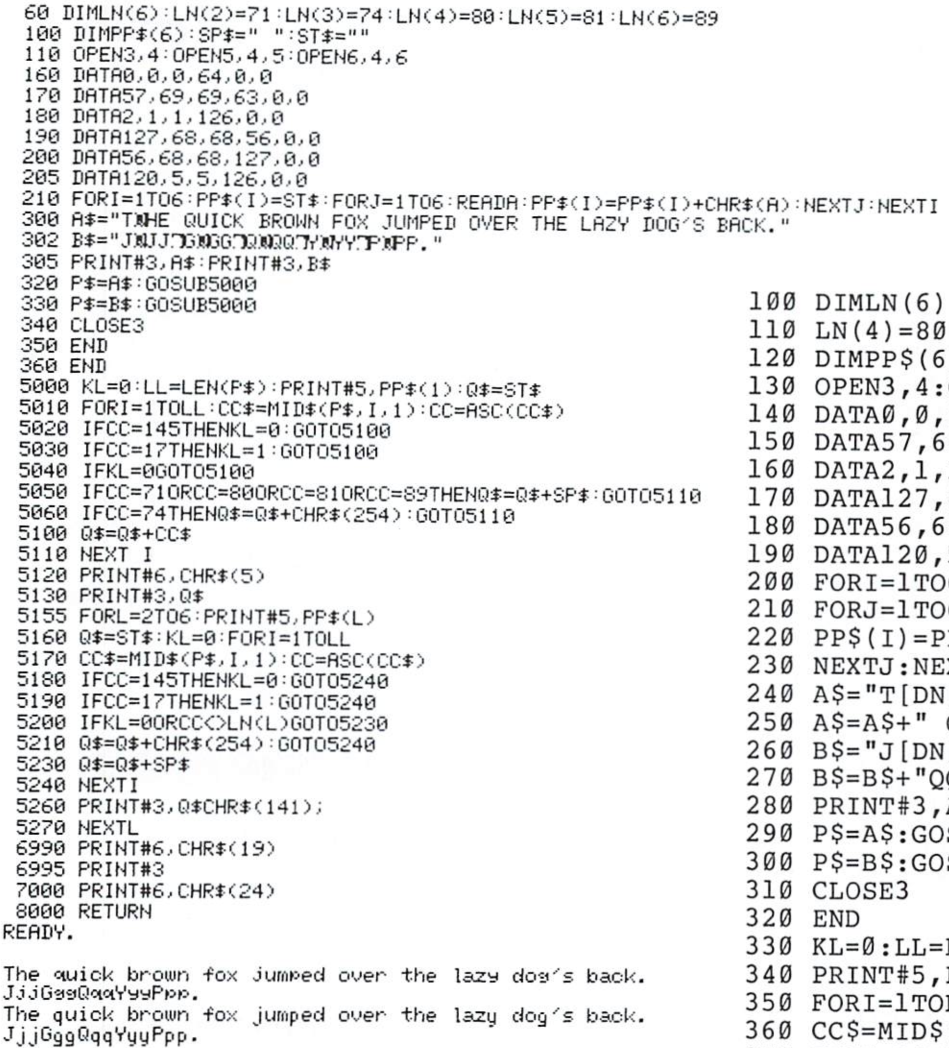
3. Provide a copy of your program on tape or diskette. We use an NEC Spinwriter with multistrike carbon ribbon to prepare program listings for publication. Our current setup has an RS-232 Spinwriter interfaced to one of our PETs with a SYM-1 doing all of the handshaking. Larry and I can't wait to get our hands on a XYMEC.
4. Check the two program listings on the facing page. We've chosen W. Bunker's neat program as our sample.

Above is a photographically reduced version of a listing we produced on our 2022. We use a good ribbon, and thru reduction can produce a very readable listing. We'll continue to do this where it really helps demonstrate a point, as in the output of this program, or Len Lindsay's related program on page 94.

While it takes us four lines to accomplish his line 210, we end up with a more structured program for consistency in reproduction.

Our statements 260 and 270 correspond to his statement 302. Our symbols represent his, as explained previously, and should be easier to reconstruct. Drop us a note with your short hints for the Programmer's Corner. And thanks Mr. Bunker for a thoroughly useful program.

COMPUTE NEEDS YOU!



```
 60 DIMLN(6):LN(2)=71:LN(3)=74:LN(4)=80:LN(5)=81:LN(6)=89
 100 DIMPP$(6):SP$=" ":ST$=""
 110 OPEN3,4:OPEN5,4,5:OPEN6,4,6
 160 DATA0,0,0,64,0,0
 170 DATA57,69,69,63,0,0
 180 DATA2,1,1,126,0,0
 190 DATA127,68,68,56,0,0
 200 DATA56,68,68,127,0,0
 205 DATA120,5,5,126,0,0
 210 FORI=1TO6:PP$(I)=ST$:FORJ=1TO6:READA:PP$(I)=PP$(I)+CHR$(A):NEXTJ:NEXTI
 300 A$="T▮HE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK."
 302 B$="J▮JJ⌐G▮GG⌐Q▮QQ⌐Y▮YY⌐P▮PP."
 305 PRINT#3,A$:PRINT#3,B$
 320 P$=A$:GOSUB5000
 330 P$=B$:GOSUB5000
 340 CLOSE3
 350 END
 360 END
 5000 KL=0:LL=LEN(P$):PRINT#5,PP$(1):Q$=ST$
 5010 FORI=1TOLL:CC$=MID$(P$,I,1):CC=ASC(CC$)
 5020 IFCC=145THENKL=0:GOTO5100
 5030 IFCC=17THENKL=1:GOTO5100
 5040 IFKL=0GOTO5100
 5050 IFCC=71ORCC=80ORCC=81ORCC=89THENQ$=Q$+SP$:GOTO5110
 5060 IFCC=74THENQ$=Q$+CHR$(254):GOTO5110
 5100 Q$=Q$+CC$
 5110 NEXT I
 5120 PRINT#6,CHR$(5)
 5130 PRINT#3,Q$
 5155 FORL=2TO6:PRINT#5,PP$(L)
 5160 Q$=ST$:KL=0:FORI=1TOLL
 5170 CC$=MID$(P$,I,1):CC=ASC(CC$)
 5180 IFCC=145THENKL=0:GOTO5240
 5190 IFCC=17THENKL=1:GOTO5240
 5200 IFKL=0ORCC<>LN(L)GOTO5230
 5210 Q$=Q$+CHR$(254):GOTO5240
 5230 Q$=Q$+SP$
 5240 NEXTI
 5260 PRINT#3,Q$CHR$(141);
 5270 NEXTL
 6990 PRINT#6,CHR$(19)
 6995 PRINT#3
 7000 PRINT#6,CHR$(24)
 8000 RETURN
READY.

The quick brown fox jumped over the lazy dog's back.
JjjGggQqqYyyPpp.
The quick brown fox jumped over the lazy dog's back.
JjjGggQqqYyyPpp.
```

Lower Case Descention on the Commodore 2022 Printer

W. M. Bunker

PO Box 9008
Daytona Beach, FL 32020

The programmability of the printer makes it possible to do just about anything you want with it, from listing a program to plotting. I'm enclosing one example. The lower case letters on the printer are made as shown on the first two lines at the bottom of the listing. This is common on dot matrix printers -- my General Electric Terminet 30 at work, far more expensive than the 2022, does this.

On the 2022, if you don't like their lower case letters, you can make your own. These are shown below the original version. The program listed produces the improved letters. For each line to be printed, define it as P$, then GOSUB 5000, and printing as shown will result.

```
100 DIMLN(6):LN(2)=71:LN(3)=74
110 LN(4)=80:LN(5)=81:LN(6)=89
120 DIMPP$(6):SP$=" ":ST$=""
130 OPEN3,4:OPEN5,4,5:OPEN6,4,6
140 DATA0,0,0,64,0,0
150 DATA57,69,69,63,0,0
160 DATA2,1,1,126,0,0
170 DATA127,68,68,56,0,0
180 DATA56,68,68,127,0,0
190 DATA120,5,5,126,0,0
200 FORI=1TO6:PP$(I)=ST$
210 FORJ=1TO6:READA
220 PP$(I)=PP$(I)+CHR$(A)
230 NEXTJ:NEXTI
240 A$="T[DN]HE QUICK BROWN FOX JUMPED"
250 A$=A$+" OVER THE LAZY DOG'S BACK."
260 B$="J[DN]JJ[UP]G[DN]GG[UP]Q[DN]"
270 B$=B$+"QQ[UP]Y[DN]YY[UP]P[DN]PP."
280 PRINT#3,A$:PRINT#3,B$
290 P$=A$:GOSUB330
300 P$=B$:GOSUB330
310 CLOSE3
320 END
330 KL=0:LL=LEN(P$)
340 PRINT#5,PP$(1):Q$=ST$
350 FORI=1TOLL
360 CC$=MID$(P$,I,1):CC=ASC(CC$)
370 IFCC=145THENKL=0:GOTO460
380 IFCC=17THENKL=1:GOTO460
390 IFKL=0 GOTO460
400 IFCC=71THENQ$=Q$+SP$:GOTO470
410 IFCC=80THENQ$=Q$+SP$:GOTO470
420 IFCC=81THENQ$=Q$+SP$:GOTO470
430 IFCC=89THENQ$=Q$+SP$:GOTO470
440 IFCC=74THENQ$=Q$+CHR$(254)
450 GOTO470
460 Q$=Q$+CC$
470 NEXT I
480 PRINT#6,CHR$(5)
490 PRINT#3,Q$
500 FORL=2TO6:PRINT#5,PP$(L)
510 Q$=ST$:KL=0
520 FORI=1TOLL
530 CC$=MID$(P$,I,1):CC=ASC(CC$)
540 IFCC=145THENKL=0:GOTO590
550 IFCC=17THENKL=1:GOTO590
560 IFKL=0ORCC<>LN(L)GOTO580
570 Q$=Q$+CHR$(254):GOTO590
580 Q$=Q$+SP$
590 NEXT I
600 PRINT#3,Q$ CHR$(141)
610 NEXT L
620 PRINT#6,CHR$(19)
630 PRINT#3
640 PRINT#6,CHR$(24)
650 RETURN
```

Saving Memory in Large Programs:

Mike Richter

1. Pack your statements into long lines. Each new line number costs four bytes more than a colon for continuation.
2. On very long lines, use the shorthand (? for PRINT, GO for GOTO) to stay within the 80-character limit.
3. Replace IF X = O THEN A = A + 1 with A = A-(X = O). A logical expression evaluates to -1 if true, O if false. Those values may be used arithmetically.
4. Some IF. . .GOTO structures can be replaced efficiently with ON. . .GOTO. For example:
   1000 IF X = 1 GOTO 100
   1010 GOTO 200
   may be replaced with: 1000 ONXX GOTO 100: GOTO 200
5. Close up the spaces in the BASIC statements; they just waste storage, although they may help readability.
6. Semicolons are rarely needed in single-line printing. For example,
   PRINT TAB(5)"X = "X
   prints the same as PRINT TAB(5);"X = ";X
7. Use computed values in TAB and SPC expressions rather than FOR/NEXT.
8. A string of blanks (usually, 39 of them) is useful for erasing all or a part of a line. To erase 20 characters, PRINT LEFT$(BL$,20). Variations and extensions of the idea are numerous. A string of cursor control characters can be used to locate a line in the same way. With CC$ defined as "home, 24xcd", you get to line N by PRINT LEFT$(CC$,N + 1).
9. Putting the above material together may save 20-50% of the code. One check you can make on how tightly the program is packed is to figure out what fraction of your lines must end where they do because they either finish with an unavoidable IF or just plain run out of space on the 80-character line.

Don't be fanatical about saving space, but wonders can sometimes be worked. I took a 24K APPLE program and added features in transferring it to the PET. The result took less than 2.4K of memory! OREGON TRAIL is another example which probably took well over 20K as published, yet runs in the 8K (really, 7K-1) of a PET when properly compressed.

APPARENT MALFUNCTION OF THE < KEY

Jim Butterfield

In many PETs, the less-than (<) key will appear to be dead if cassette tape drive #1 is disconnected.

If you have to run without a tape drive, you might like to make up a plus for the tape edge connector. Putting a ground on the input line (connecting pins A-1 and D-4 on the cassette edge connector) should make the problem disappear.

YES NOVA SCOTIA, THERE IS A FOUR ROM PET.

Robert Lock

If you're the owner of a new PET who's wondering why you keep hearing about four ROMs when you've got five, here's the story: The 4K ROMs on the new PETs have pin configurations identical to those of the 2K ROMs used in the 24 pin versions of the old PETs. When Commodore ran out of one of the 4K ROMs several months ago, they promptly installed (with a few well-placed jumpers) two 2K 24 pin retrofit ROMs to replace it. I figure they shipped between 500 and 1000 machines with five ROMs. If your machine has four ROMs, followed by two empty sockets, followed by a fifth ROM, then welcome aboard. You've got a special machine. The ROMs at each end (1 and 7) are 2K ROMs, the other 3 are 4K ROMs. Now don't get me wrong. There's nothing wrong with your machine... it works just like all the rest. Your machine's just "special", and I thought you might like to know why.

The deadly linefeed

Jim Butterfield

When you write a Basic statement like PRINT X, you print the value and start a new line.

To start a new line, the PET sends two characters: a RETURN, which terminates the old line, and a LINEFEED, which is often not needed and is sometimes deadly.

The linefeed character (CHR$(10)) is there to tell some types of printer that it's time to move the paper up. The Commodore printers don't need it, but others often do.

There are at least two cases, however, when you must not send the line feed character - it will give you trouble.

Case one is when you're sending data to a disk file. If you should write this character to disk, you'll read it later - and it will give you problems.

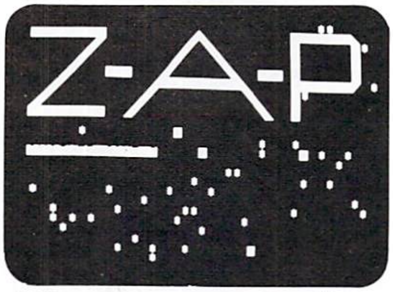
Case two is when you're sending a formatted line to the Commodore printer - that is, to secondary address #1. It will seem to work in many cases; but you'll have problems when you try to change the format line by addressing secondary address #2.

How do you avoid sending the linefeed? Don't let PET terminate a line for you: do it yourself by sending the RETURN character.

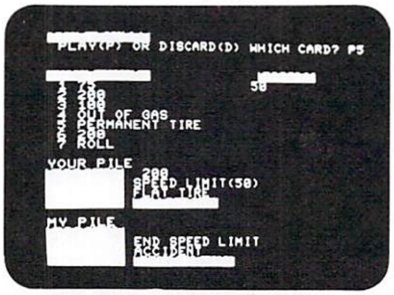
So instead of sending PRINT#5, X code PRINT#5, X;CHR$(13); and be sure you don't forget the semicolon at the end of the line. If you have a lot of print lines of this type, you can set the RETURN into a string variable and save space: say R$ = CHR$(13) and then you can code PRINT#5, X;R$; to do the job.

Software for the PET

PROGRAMMA

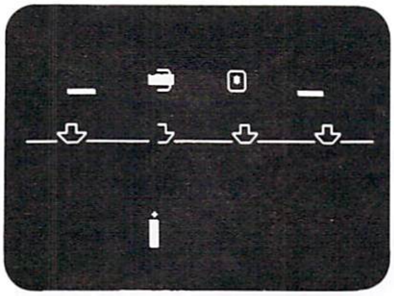


ZAP $6.95

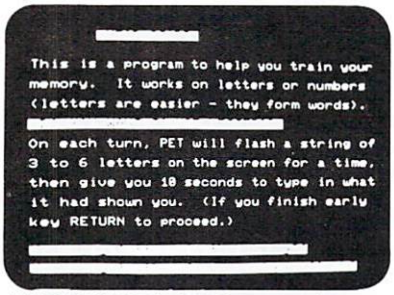


```
PLAY(P) OR DISCARD(D) WHICH CARD? P5

 1 75                                   50
 2 200
 3 100
 4 OUT OF GAS
 5 PERMANENT TIRE
 6 200
 7 ROLL
YOUR PILE
          200
          SPEED LIMIT(50)
          FLAT TIRE

MY PILE

          END SPEED LIMIT
          ACCIDENT
```

1000 MILES $9.95

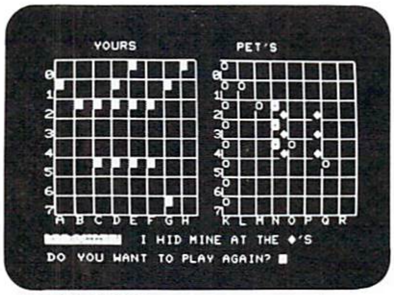


SHOOTING GALLERY $9.95



```
This is a program to help you train your
memory.  It works on letters or numbers
(letters are easier - they form words).

On each turn, PET will flash a string of
3 to 6 letters on the screen for a time,
then give you 10 seconds to type in what
it had shown you.  (If you finish early
key RETURN to proceed.)
```

HEAD START/AS-IMS $9.95



```
             I HID MINE AT THE ◆'S
DO YOU WANT TO PLAY AGAIN? ■
```

BATTLESHIP $9.95

ACT Petsoft

We are proud to announce that PROGRAMMA INTERNATIONAL, INC. is now the exclusive representative and distributor of all software developed by ACT PETSOFT in the United Kingdom. Over 100 new PET programs will be released within the next three months containing exciting games and applications. See our ads or write for further information.

WORD PROCESSOR FOR THE PET

The PROGRAMMA Word Processor for the Pet is a suitable text processor that does exactly what you require, without having to expose the user to a lengthy learning and training session. Versions are available for the OLD and NEW ROM Pets, and support for various types of printers is available. The system can print the completed text either on the screen or on a printer. There are several modes of operation offered by the Word Processor. Text can be edited, text can be loaded from cassette, text can be saved to cassette, text can be printed to the CRT or printer, text can be read unto the screen. The system is very user oriented and simple to operate.

RS-232 Word Processor	**$19.95**
AXIOM Word Processor	**19.95**
Selecterm Word Processor	**19.95**

PAS-PERSONAL ACCOUNTING SYSTEM

The PAS System for the Pet relies heavily on the Pet's data file capabilities to generate and validate files containing a detailed description of your financial transactions. Designed specifically to be used with your check register as the data source, PAS consists of six programs including those to generate and edit data files, balance the checkbook, reconcile the bank statement, report checks that are outstanding, and summarize transactions over a period of time. Three files are generated by the PAS System: monthly transactions, outstanding checks and summary. The system is designed to operate with either the OLD or NEW ROM Pets using the cassette as the mass storage device. A version for the COMPU-THINK Disk unit is also available.

PAS on cassette	**$19.95**
PAS on COMPU-THINK Disk	**24.95**

All orders include 3% postage and handling.
Pet is a registered trademark of Commodore International.
California residents add 6% Sales Tax.
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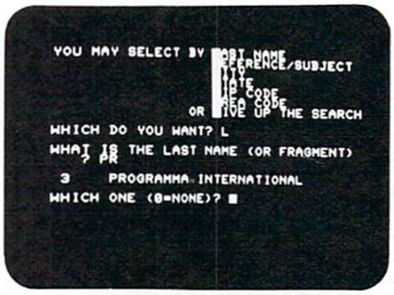
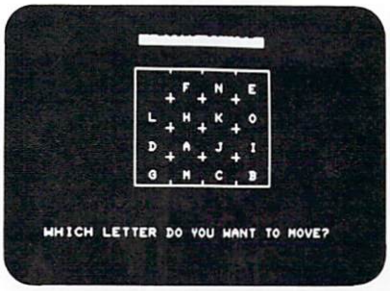


```
YOU MAY SELECT BY  AST NAME
                   EFERENCE/SUBJECT
                   ITY
                   TATE
                   IP CODE
                   REA CODE
               OR  IVE UP THE SEARCH
WHICH DO YOU WANT? L
WHAT IS THE LAST NAME (OR FRAGMENT)
   ? PR
 3     PROGRAMMA INTERNATIONAL
WHICH ONE (0=NONE)? ■
```

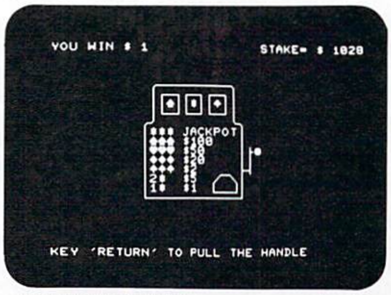
TELEPHONE BOOK $6.95



```
          F   N   E
        +   +   +
      L   H   K   O
        +   +   +
      D   A   J   I
        +   +   +
      G   M   C   B

WHICH LETTER DO YOU WANT TO MOVE?
```

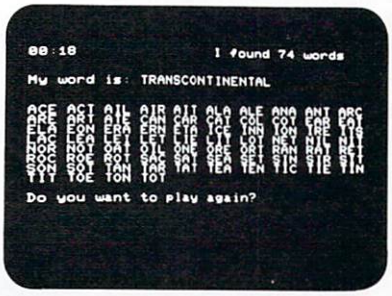
LETTER SQUARES $6.95



```
YOU WIN $ 1                STAKE= $ 1020

KEY 'RETURN' TO PULL THE HANDLE
```

SLOT MACHINE $9.95

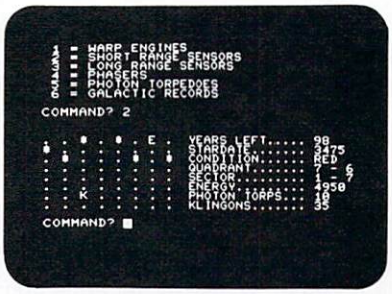


```
00:10                I found 74 words

My word is: TRANSCONTINENTAL

ACE ACT AIL AIR AIT ALA ALE ANA ANT ARC
ARE ART ATE CAN CAR CAT COL COT EAR EAT
ELA EON ERA ERN ETA ICE INN ION IRE ITS
LAC LEA LEI LET LIE LIT LOT NET NIL NIT
NOR NOT OAT OIL ONE ORE ORT RAN RAT RET
ROC ROE ROT SAC SAT SEA SET SIN SIR SIT
SON SOT TAN TAR TAT TEA TEN TIC TIE TIN
TIT TOE TON TOT
Do you want to play again?
```

TRACE-A-WORD $9.95



```
 1 = WARP ENGINES
 2 = SHORT RANGE SENSORS
 3 = LONG RANGE SENSORS
 4 = PHASERS
 5 = PHOTON TORPEDOES
 6 = GALACTIC RECORDS
COMMAND? 2

 . . * . * . E .  YEARS LEFT..... 98
 * . . . . . . .  STARDATE....... 3475
 . * . . . * . *  CONDITION...... RED
 . . . . . . . .  QUADRANT....... 7 - 6
 . . . . . . . .  SECTOR......... 1 - 7
 . . . . . . . .  ENERGY......... 4950
 . . K . . . . .  PHOTON TORPS... 10
 . . . . . . . .  KLINGONS....... 35
COMMAND? ■
```

STAR TREK $9.95

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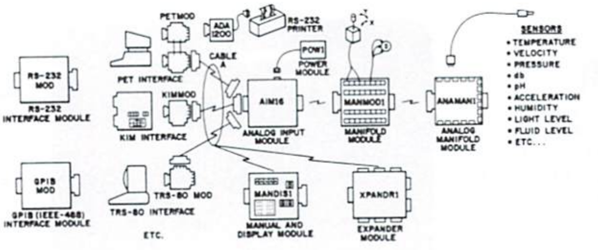

PETMOD
ADA 1200
RS-232 PRINTER
SENSORS
• TEMPERATURE
• VELOCITY
• PRESSURE
• db
• pH
• ACCELERATION
• HUMIDITY
• LIGHT LEVEL
• FLUID LEVEL
• ETC...
RS-232 MOD
RS-232 INTERFACE MODULE
PET INTERFACE
CABLE A
POW1
POWER MODULE
KIMMOD
AIM16
MANMOD1
ANAMAN1
KIM INTERFACE
ANALOG INPUT MODULE
MANIFOLD MODULE
ANALOG MANIFOLD MODULE
GPIB MOD
GPIB (IEEE-488) INTERFACE MODULE
TRS-80 MOD
TRS-80 INTERFACE
MANDIS1
MANUAL AND DISPLAY MODULE
XPANDR1
EXPANDER MODULE
ETC.

The world we live in is full of variables we want to measure. These include weight, temperature, pressure, humidity, speed and fluid level. These variables are continuous and their values may be represented by a voltage. This voltage is the analog of the physical variable. A device which converts a physical, mechanical or chemical quantity to a voltage is called a sensor.

Computers do not understand voltages: They understand bits. Bits are digital signals. A device which converts voltages to bits is an analog-to-digital converter. Our AIM16 (Analog Input Module) is a 16 input analog-to-digital converter.

The goal of Connecticut microComputer in designing the DAM SYSTEMS is to produce easy to use, low cost data acquisition modules for small computers. As the line grows we will add control modules to the system. These acquisition and control modules will include digital input sensing (e.g. switches), analog input sensing (e.g. temperature, humidity), digital output control (e.g. lamps, motors, alarms), and analog output control (e.g. X-Y plotters, or oscilloscopes).

Analog Input Module

The AIM16 is a 16 channel analog to digital converter designed to work with most microcomputers. The AIM16 is connected to the host computer through the computer's 8 bit input port and 8 bit output port, or through one of the DAM SYSTEMS special interfaces.

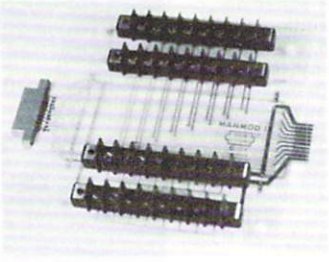
The input voltage range is 0 to 5.12 volts. The input voltage is converted to a count between 0 and 255 (00 and FF hex). Resolution is 20 millivolts per count. Accuracy is 0.5% ± 1 bit. Conversion time is less than 100 microseconds per channel. All 16 channels can be scanned in less than 1.5 milliseconds.

Power requirements are 12 volts DC at 60 ma.

The POW1 is the power module for the AIM16. One POW1 supplies enough power for one AIM16, one MANMOD1, sixteen sensors, one XPANDR1 and one computer interface. The POW1 comes in an American version (POW1a) for 110 VAC and in a European version (POW1e) for 230 VAC.

AIM16 . . . $179.00
POW1a . . . $ 14.95
POW1e . . . $ 24.95

Connectors



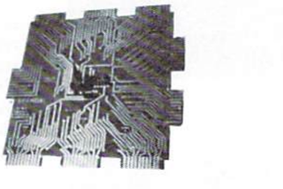
The AIM16 requires connections to its input port (analog inputs) and its output port (computer interface). The ICON (Input CONnector) is a 20 pin, solder eyelet, edge connector for connecting inputs to each of the AIM16's 16 channels. The OCON (Output CONnector) is a 20 pin, solder eyelet edge connector for connecting the computer's input and output ports to the AIM16.

The MANMOD1 (MANifold MODule) replaces the ICON. It has screw terminals and barrier strips for all 16 inputs for connecting pots, joysticks, voltage sources, etc.

CABLE A24 (24 inch interconnect cable has an interface connector on one end and an OCON equivalent on the other. This cable provides connections between the DAM SYSTEMS computer interfaces and the AIM16 or XPANDR1 and between the XPANDR1 and up to eight AIM16s.

ICON . . . $ 9.95
OCON . . . $ 9.95
MANMOD1 . . . $59.95
CABLE A24 . . . $19.95

XPANDR1



The XPANDR1 allows up to eight AIM16 modules to be connected to a computer at one time. The XPANDR1 is connected to the computer in place of the AIM16. Up to eight AIM16 modules are then connected to each of the eight ports provided using a CABLE A24 for each module. Power for the XPANDR1 is derived from the AIM16 connected to the first port.

XPANDR1 . . . $59.95

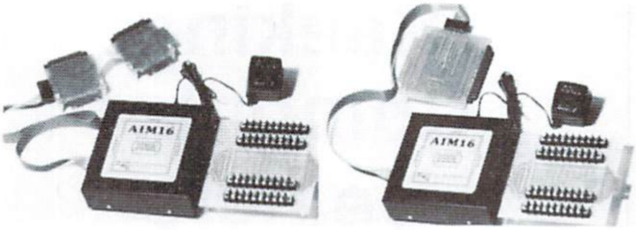
TEMPSENS

This module provides two temperature probes for use by the AIM16. This module should be used with the MANMOD1 for ease of hookup. The MANMOD1 will support up to 16 probes (eight TEMPSENS modules).

Resolution for each probe is 1°F.

TEMPSENS2P1 (-10°F to 120°F) . . . $49.95

Computer Interfaces and Sets



For your convenience the AIM16 comes as part of a number of sets. The minimum configuration for a usable system is the AIM16 Starter Set 1. This set includes one AIM16, one POW1, one ICON and one OCON. The AIM16 Starter Set 2 includes a MANMOD1 in place of the ICON. Both of these sets require that you have a hardware knowledge of your computer and of computer interfacing.

For simple plug compatible systems we also offer computer interfaces and sets for several home computers.

The PETMOD plugs into the back of the Commodore PET computer and provides two PET IEEE ports, one user port and one DAM SYSTEMS port. The PETMOD is connected to the AIM16 or XPANDR1 with CABLE A24. The PETSET1 includes one PETMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD1. To read and display a single AIM16 channel (N) using the PETSET1 the BASIC statements

```
POKE59426,N:POKE59426,255:X=PEEK(59471):PRINT"CHANNEL "N"="X
```

are all that is needed.

The KIMMOD plugs into the COMMODORE KIM applications connector and provides one application connector and one DAM SYSTEM'S port. The KIMMOD is connected to the AIM16 or XPANDR1 with CABLE A24. Assembly and machine language programs for reading and displaying data are included. The KIMSET1 includes one KIMMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD 1.

All sets come in American and European versions.

AIM16 Starter Set 1a (110 VAC)	**$189.00**
AIM16 Starter Set 1e (230 VAC)	**$199.00**
AIM16 Starter Set 2a (110 VAC)	**$259.00**
AIM16 Starter Set 2e (230 VAC)	**$269.00**
PETMOD	**$ 49.95**
KIMMOD	**$ 39.95**
PETSET 1a	**$295.00**
PETSET1e	**$305.00**
KIMSET1a	**$285.00**
KIMSET1e	**$295.00**

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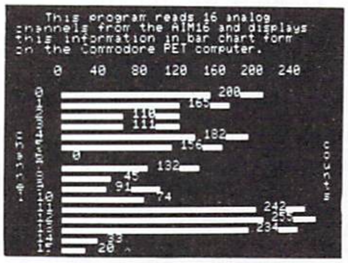
If you cannot see our products in advance, and order direct from us, we offer a money back guarantee. If our products don't perform as you expect, return the merchandise to us within 30 days, in its original condition, and we will refund the purchase price.

Our standard warranty for all our products is 90 days.



```
   This program reads 16 analog
channels from the AIM16 and displays
this information in bar chart form
on the Commodore PET computer.
```

Order Form

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Dear Sirs:
Your new magazine has many interesting articles. I subscribed last week, the day before my Fall, 1979, issue arrived.
Trace for the PET is a fascinating program. However the version for original ROM's seems to have an error in line 21. The sixth number should be 36 instead of 44. The effect of the error is that the last digit of the line number does not show on the screen. Apparently the code for BIT (zero page), $24 was given as BIT (absolute), $2C, reading a two-byte address instead of only one byte.
I did enjoy the fall issue and look forward to future ones.

Sincerely,
Thomas M. Jenkins
Professor of Mathematics
University of Louisville
Louisville, Kentucky 40208

Editor's Note: Thanks for the letter. . .actually there are two corrections to the trace listings presented on pages 84-85 of the Fall COMPUTE. We suggest the following changes for best results:

Page 84: Line 21 Change 44 to 41
Page 85: Line 30 Change 167 to 160

RCL

New Product announcement: 4 Part Music System for PET.

A B Computers has announced the KL-4M four part music board for Commodore PET-CBM computers. Price is $34.95.

The board includes an 8-bit Digital to Analog Converter, a low pass filter to eliminate high frequency computer generated hiss, and an on-board audio amplifier. An RCA-type jack is also included for quick attachment of your speaker.

Connection is made via the PET parallel and cassette parts. Both parts are extended with duplicate connectors (with keyways) so I/O capabilities are not reduced in any way.

Board orientation is parallel to the back of the PET so additional table space is not required. The KL-4M is compatible with any of the 4 part music monitors, and an extensive library of precoded songs is available.

Also available is the Graphic Music Monitor for PET to support 4-part harmony systems (such as the KL-4M). The GMM is written entirely in 6502 machine language and displays the musical staff and notes on the PET screen. GMM provides an easy way to enter 4-part music from the keyboard, as well as complete edit capability (including note insertion and deletion). Other features include "record changer" mode to load successive songs from tape, user definable keyboard, and complete tempo flexibility. Price is $24.95. For more information, contact A B Computers, 115 E. Stump Rd., Montgomeryville, PA 18936. 215-699-5826.

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USING DIRECT ACCESS FILES WITH THE COMMODORE 2040 DUAL DRIVE DISK

PART TWO

Chuck Stuart, President
CMS Software Systems
5115 Menefee Drive
Dallas, TX 75227

In the fall issue of COMPUTE we attempted to explain in detail how to use and understand Direct Access Files with the new Commodore 2040 Dual Drive Floppy Disk. Using and understanding Direct Access file organization is mandatory if you plan to develop any serious business software for the Commodore microcomputer system.

In this issue we will expand on the principles previously covered and also try to answer some of the questions we have received in the mail concerning those principles. References to line numbers in the following material refer back to the Direct Access coding explained in part one. It will help you to understand the following information if you have a copy of that article handy for reference. (See "Using Direct Access Files With The Commodore 2040 Dual Drive Disk", p.93, COMPUTE, Fall, 1979)

Before setting started, it would probably be prudent to point out what seemed an error to many readers. Some thought that the GOTO 1000 in lines 1220, 1320, 1420, and 1520 should have been a GOSUB 1000 instead. On glancing over the coding this might appear to be true but a more careful examination of the logic flow will show that each of the disk utility routines beginning at lines 1200, 1300, 1400, and 1500 flow into the error channel read routine beginning at line 1000 and the RETURN in line 1090 is the logical return path for each of these subroutines.

If you own a 2040, you should have by now received the final version of the instruction manual. If not, call (408) 727-1130 and ask for one. Although much more professional looking in appearance, this final version offers little more useful information that the temporary version, especially in the area of Direct Access file organization. In light of this shortcoming, we will continue to pass along what practical information we uncover during the continued development and support of our business software systems. At the same time, we would appreciate receiving any additional information and user hints that others might discover.

UPDATING DIRECT ACCESS FILES

As we pointed out in part one, one of the biggest reasons for using Direct Access files is that it gives you the ability to read in any record in a file, update the information contained in that record, and then write that record back to the file without disturbing any other records in the file. The records can be accessed in any other records in the file. The records can be accessed in any order regardless of their physical order on the disk. The last record in the file can be found and read as easily and as fast as the first record in the file.

Unfortunately, the BLOCK-READ and BLOCK-WRITE disk utility commands that we previously covered do not lend themselves well to this type of file updating. Early on in our software development we discovered this problem. The B-W command places the value of the current buffer pointer in the zero byte of the block and the B-R command uses this value to set the STATUS WORD to 64. During this process the record data is affected if an attempt is made to update more than one record per OPEN statement. The only answer was to OPEN and then CLOSE the file each time a record in the file was to be updated. Needless to say, this method greatly slowed processing. Not because of the extra time required to OPEN and CLOSE the files, but because of the time required for the disk READ/WRITE HEAD to physically move to the disk Directory Track, track 18, to update the BLOCK AVAILABILITY MAP (BAM) and then return to the processing track.

Fortunately there is a better method. The USER command U1 is used rather than the BLOCK-WRITE command. The following two lines should replace the corresponding lines of BASIC coding shown in part one.

```
1310 PRINT#15,   U1 ;CH;D;T;S
1410 PRINT#15,   U2 ;CH;D;T;S
```

The USER command, U1, performs the same function as the BLOCK-READ command, B-R, except that a 255 character block is assumed since any character count stored in the zero byte is ignored. The USER command, U2, is identical to the BLOCK-WRITE command, B-W, except that the contents of the zero byte are unchanged when the block is written to the disk. When using the U1 and U2 commands for reading and writing Direct Access disk files, you must always set the buffer pointer to the desired position before issuing a PRINT# or INPUT# command. This is accomplished through the use of the BUFFER-POINTER command, B-P, as explained in part one. With a little practice you should now be able to update Direct

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Access files on the 2040 with no problems.

DETECTING A DISK FULL CONDITION USING DIRECT ACCESS FILES

In explaining how to create Direct Access files, we left out one rather important detail. That was how to tell when the disk is full. Go back to lines 1100-1190 and study the associated description of how the BLOCK-ALLOCATE command works. Remember that this command is used for finding and allocating the next available disk sector in creating and expanding a Direct Access file. The track and sector address of the next available block is returned in the third and fourth parameters of the Command Channel. This is ET$ and ES$ in line 1120 of our example. The block located at that track and sector is then allocated and becomes part of our Direct Access file.

All this is great but what happens when all of the available disk sectors have been allocated? How does DOS manage to inform us of this rather important event? Simple. When no more disk sectors are available then DOS returns 00's in ET$ and ES$ instead of the address of the next available sector. Be sure to check EN$ for a 65 to ensure that some type of disk error has not occured that might also cause ET$ and ES$ to be set to 00. The following lines of BASIC coding should be inserted in the program example in part one.

```
1140 IF EN$ <> 65   GOTO 930
1150 IF ET$ = 00 AND ES$ = 00
GOTO 9000
1160 T = VAL(ET$): S = VAL(ES$):
GOTO 1110
```

Notice that the original line 1140 is replaced by the new one. Line 1140 now checks for the correct error number to ensure that some unexpected disk error has not occured. If one has occured, EN$ is any value other than 65, then control is passed to the error handling routine. Notice that the branch is to line 930 rather than the usual line 900. This is because the error channel has already been read in line 1120. Line 1150 checks to see if the disk is full and if so, control is passed to the appropriate routine at line 9000. Line 1160 resets T and S to the track and sector address of the next available sector and branches back to request allocation.

That's about it for this installment. Next time we hope to be able to share with you more secrets of the 2040. We'll be glad to answer any questions you might have if you enclose a self addressed stamped envelope when you write.

```
100 REM THIS IS AN EXAMPLE OF DIRECT
105 REM ACCESS FILE UPDATING.
106 REM
110 REM LINES 200 TO 299 READ A RECORD
115 REM FROM A DIRECT ACCESS FILE,
120 REM UPDATE THE RECORD, THEN WRITE
125 REM THE RECORD BACK TO THE FILE.
126 REM
130 REM LINES 1000 THROUGH 1520 WERE
135 REM DISCUSSED IN DETAIL IN PART
140 REM ONE OF THIS SERIES.
150 REM
200 REM UPDATE A DIRECT ACCESS RECORD
210 CH=4: D=0: BP=1: CR$=CHR$(13)
220 OPEN4,8,4,"#": GOSUB 1000
230 T=15: S=12: GOSUB 1300: GOSUB 1500
240 INPUT#4,A$,B$,C$,D$,K
250 A$="TEST": K=K+1
260 GOSUB 1500
270 PRINT#4,A$ CR$ B$ CR$ C$ CR$
275 PRINT#4,D$ CR$ K CR$
280 GOSUB 1400
290 CLOSE 4
299 END
1000 REM ERROR CHANNEL INPUT ROUTINE
1010 INPUT#15, EN$,EM$,ET$,ES$
1020 IF EN$="00" GOTO 1090
1030 PRINT "DISK ERROR #" EN$ " " EM$;
1031 PRINT " " ET$ " " ES$
1040 INPUT "CONTINUE? "; A$
1050 IF A$<>"Y" THEN STOP
1090 RETURN
1091 REM
1300 REM READ A D/A BLOCK
1310 PRINT#15, "U1";CH;D;T;S
1320 GOTO 1000
1391 REM
1400 REM WRITE A D/A BLOCK
1410 PRINT#15, "U2";CH;D;T;S
1420 GOTO 1000
1491 REM
1500 REM SET BUFFER POINTER
1510 PRINT#15, "B-P";CH;BP
1520 GOTO 1000
```

EPROM SOFTWARE PROGRAMMER FOR PET

Optimal Technology, Inc. (Blue Wood 127, Earlysville, VA 22936) announces EPROM Programmer software for the Commodore Business Machines' PET Computer. The software provides all the necessary programs for using Optimal Technology's EP-2A-79 EPROM Programmer with the PET. Software, supplied on cassette, includes routines for (1) checking if EPROM is erased, (2) programming, (3) verifying programming and (4) reading the contents of EPROM into memory.

The programmer connects to the PET via the user I/O port. Easy to use, the program is self-prompting. Software supports the programming of a variety of EPROMS, including 2708, 2716, TMS 2716, 2732 and new Motorola 8K x 8 MCM68764 EPROM. Price $19.95.

NULL RETURN ("LINPUT") SIMULATION FOR PET USERS

Yoshiko Matsumoto/Jamaica High School, Jamaica, New York
Donald Weinshank/Department of Natural Science, Michigan State University
Harvey Davis/Department of Mathematics, Michigan State University

In many dialects of BASIC---but not the PET one---a null string can be employed by the user to step through a series of frames to be displayed. In Hewlett Packard 2000 BASIC, for example, the LINPUT function senses when the RETURN is touched without any prior character string:

```
100 DIM A$ (20)
110 PRINT"TOUCH RETURN TO GO ON."
120 LINPUT A$
   .
   .
   .
```

Executing this code permits the user to advance to the next part of the program when she/he is ready to do so simply by touching RETURN.

The October, 1978 PET 2001-8 Manual (p. 36) says, "In PET, if input is followed by only a carriage return with no other typing, it is considered by BASIC to be a termination of the program, same as a stop key. This particular feature is a carry over from the days of teletype BASIC when this was the most convenient way of terminating a program."

Quite by accident, one of us (YM) discovered a useful PET idiosyncracy which stimulates the null string (LINPUT) return. Incorporated into a subroutine as in the following code, TOUCH RETURN TO GO ON may be called from any point of a PET BASIC program.

```
100 DIM A$(100)
110 GOSUB 900
120 INPUTA$
130 GOTO 9999
900 PRINT"TOUCH RETURN TO GO ON."
910 RETURN
9999 PRINT"END OF PROGRAM"
10000 GOTO 110    Tests Repeated Iterations
10001 LND
```

What makes this code idiosyncratic is that it will work with only one combination of characters and blanks in the print line. The INPUT A$ must follow a semicolon (;) which ends a character + blank string totaling 38. The result of writing out such a string is to place the (?) from the INPUT at the end of a line and the flashing cursor at the beginning of the subsequent line. If the number of print characters plus blanks is not equal to 38, touching RETURN will---as the manual says---break out of the program. (Note that, in the listing, non-printing characters, such as those which begin and end the reverse field, are excluded from the total.)

For instructional software (Computer Assisted Instruction), TOUCH RETURN TO GO ON is a useful utility. While we have tested the code in four different 8K "Personal Computer" and one 16K "Professional Computer" units, we do not know whether it will work in other PET microcomputers, or ... to be frank ... precisely why it works at all.

ACKNOWLEDGEMENTS:
We thank Dr. Norman Bell (Director, Faculty Development Program, College of Human Medicine, Michigan State University), Lafayette Radio, East Lansing, and Newman Computer Exchange, Ann Arbor for replicating the results. We also thank the MSU Computer Laboratory for use of an 8K PET.
The work was carried out as part of the 1979 MSU High School Honors Science Program, Dr. Charles Peebles, Director.

THREE-LINER DEP'T Dan Rubis

Here is compact three-liner utility program that converts a four digit hexadecimal number to a decimal number.

```
1 DIMA$(16):FORI = 1TO16:READA$(I):NEXT

2 INPUTH$:C = 0:FORI = 1TO4:FORJ =
1TO16:IFMID$(H$,I,1) = A$(J)THENC = C +
(16 (4-I))*(J-1)

3 NEXTJ:NEXTI:PRINTC:GOTO2:DATA0,
1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
```

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Dear Sir,
I would like to offer some comments on a couple of articles in the premiere issue.

- a. With regard to disabling the stop key by incrementing the IRQ vector by three locations (p 89): this also stops the real time clock.
- b. With regard to speeding up PETs (p 79) I did some experimenting and came up with the following:

I checked 4 different versions on 3 different machines (my own has both old and new ROM sets). 1. 011 version ROM small KB unit 2. upgraded ROM small KB unit 3. same as 2 but different machine 4. 32K-N unit.

1. no speed up in calculations; listing and other printing is speeded up.
2. same as 1
2. display became completely unstable vertically. Second poke no help.
4. no speed up whatever

In attempting to reconcile these differences, aside from machine 3 which I cannot explain, the differences in the other versions is as follows. 019 ROM units may be further different, but I could not get hold of one of these.

The original machines update screen memory asynchronously with respect to scan position. This is why pokes to screen memory show trash on the screen, and in fact the same effect is seen in the speeded up units during print or list. The new machines have a completely different timing mechanism which allows the screen to be continuously updated synchronously. The way the old units get around the trash is by waiting for vertical retrace before updating the screen. This means that a minimum of 1/60 of a second is needed for any screen update. Compare listing of the old and new machines and the old ones have a certain jumpiness as new lines show whereas new machines seem to scroll more smoothly.

The POKEs in question do the following things. POKE 59458, 62 turns bit 5, port B of the VIA from an input to an output. This pin normally receives the vertical retrace signal. Software in the print routines wait for the retrace to occur before updating the screen. This is not done in the new machines because of the improved timing system. Since the signal goes low when retrace is in progress, the last value stored in the input latch needs to be a low before printing can proceed. Thus POKE 59456, 223 insures that this value is low. Otherwise, the machine hangs in a timing loop which never finishes because the input is no longer an input and no real life signals can reach it outside of program values. With the signal removed and properly conditioned, print speed is now dictated by instruction cycle lengths and no longer by vertical retrace. The price paid is the necessity to live with the trash on the screen.

CAUTION: B port is a totem-pole output which means when turned from input to output allows that pin to periodically be grounded by the retrace signal. The duty cycles involved do not seem to cause any problems for short durations, but I would hesitate to operate for prolonged periods this way. A better way would be to install a switch which would either ground the pin or let vertical retrace through. Unfortunately, there is no simple way to convert the old timing system to the new.

Sincerely,
Wayne Sung

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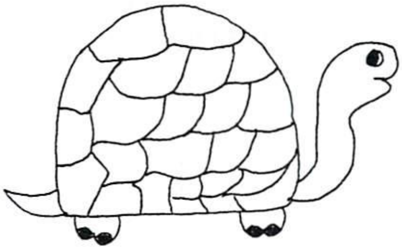
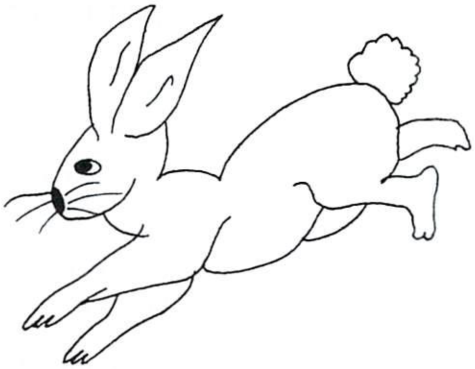


SLOW TAPE LOAD/SAVE



FAST TAPE LOAD/SAVE

Yes, if you have a 16K or 32K New ROM PET with the Commodore external tape deck, you can LOAD and SAVE on tape FASTER,.....MUCH FASTER. For example, THE RABBIT will LOAD and SAVE an 8K program in 38 seconds. Compare that with the "turtle" PET which takes 2 minutes 44 seconds.

Since THE RABBIT is an extention of the operating system, the normal PET load, save, and verify commands can still be used. Also, THE RABBIT can be used in conjunction with the BASIC PROGRAMMER'S TOOLKIT™ to enhance its commands.

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A few entry points, original/upgrade ROM

Jim Butterfield

Entry points seen in various programmer's machine language programs. The user is cautioned to check out the various routines carefully for proper setup before calling, registers used, etc.

ORIG	UPGR	DESCRIPTION
C357	C355	?OUT OF MEMORY
C359	C357	Send Basic error message
C38B	C389	Warm start, Basic
C3AC	C3AB	Crunch & insert line
C430	C439	Fix chaining & READY.
C433	C442	Fix chaining
C48D	C495	Crunch tokens
C522	C52C	Find line in Basic
C553	C55D	Do NEW
C56A	C572	Do CLR
C59A	C5A7	Reset Basic to start
C6B5	C6C4	Continue Basic execution
C863	C873	Get fixed-point number from Basic.
C9CE	C9DE	Send Return, LF if in screen mode
C9D2	C9E2	Send Return, Linefeed
CA27	CA1C	Print string
CA2D	CA22	Print precomputed string
CA49	CA45	Print character
CE11	CDF8	Check for comma
CE13	CDFA	Check for specific character
CE1C	CE03	'SYNTAX ERROR'
D079	D069	Bump Variable Address by 2
D0A7	D09A	Float to Fixed conversion
D278	D26D	Fixed to Float conversion
D679	D67B	Get byte to X reg
D68D	D68F	Evaluate String
D6C4	D6C6	Get two parameters
D73C	D773	Add (from memory)
D8FD	D934	Multiply by memory location
D9B4	D9EE	Multiply by ten
DA74	DAAE	Unpack memory variable to Accum #1
DB1B	DB55	Completion of Fixed to Float conversion
DC9F	DCD9	Print fixed-point value
DCA9	DCE3	Print floating-point value
DCAF	DCE9	Convert number to ASCII string
E3EA	E3D8	Print a character
na	E775	Output byte as 2 hex digits
na	E7A7	Input 2 hex digits to A
na	E7B6	Input 1 hex digit to A
F0B6	F0B6	Send 'talk' to IEEE
F0BA	F0BA	Send 'listen' to IEEE
F12C	F128	Send Secondary Address
E7DE	F156	Send canned message
F167	F16F	Send character to IEEE
F17A	F17F	Send 'untalk'
F17E	F183	Send 'unlisten'
F187	F18C	Input from IEEE
F2C8	F2A9	Close logical file
F2CD	F2AE	Close logical file in A
F32A	F301	Check for Stop key
F33F	F315	Send message if Direct mode
na	F322	LOAD subroutine
F3DB	F3E6	?LOAD ERROR
F3E5	F3EF	Print READY & reset Basic to start
F3FF	F40A	Print SEARCHING. . .
F411	F41D	Print file name
F43F	F447	Get LOAD/SAVE type parameters
F462	F466	Open IEEE channel for output
F495	F494	Find specific tape header block
F504	F4FD	Get string
F52A	F521	Open logical file from input parameters
F52D	F524	Open logical file
F579	F56E	?FILE NOT FOUND, clear I/O
F57B	F570	Send error message
F5AE	F5A6	Find any tape header block
F64D	F63C	Get pointers for tape LOAD
F667	F656	Set tape buffer start address
F67D	F66C	Set cassette buffer pointers
F6E6	F6F0	Close IEEE channel
F78B	F770	Set input device from logical file number
F7DC	F7BC	Set output device from LFN.
F83B	F812	PRESS PLAY. .; wait
F87F	F855	Read tape to buffer
F88A	F85E	Read tape
F8B9	F886	Write tape from buffer
F8C1	F883	Write tape, leader length in A
F913	F8E6	Wait for I/O complete or Stop key
FBDC	FB76	Reset tape I/O pointer
FD1B	FC9B	Set interrupt vector
FFC6	FFC6	Set input device
FFC9	FFC9	Set output device
FFCC	FFCC	Restore default I/O devices
FFCF	FFCF	Input character
FFD2	FFD2	Output character
FFE4	FFE4	Get character

PLOTTING WITH THE CBM 2022 PRINTER

Len Lindsay

The Commodore model 2022 Tractor Feed printer has a lot of built in features. One that I have not seen publicized yet is that it can PLOT. The line spacing can be set to advance only two dots up instead of the normal. This allows high resolution plotting vertically. However, you still are limited to the 80 print positions per line.

As an example of this concept I wrote a simple program that will print a "bowtie". When the program is finished, try creating a listing on the printer. Use the normal method:

OPEN 4,4 : CMD 4 : LIST

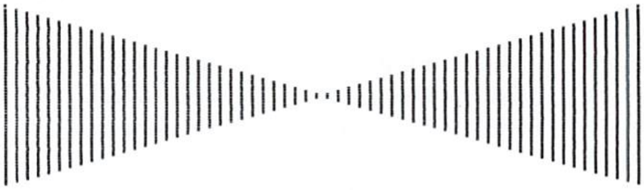
I bet you are surprised at how that came out. Your printer is still set at dot mode. Correct that by turning it off and back on. Or you can fix it with this line:

OPEN 6,4,6 : PRINT#6,CHR$(24) : CLOSE 6

Have some fun playing with the line spacing of your 2022 printer. You can change it using the following line, in either direct mode or within a program:

OPEN 1,4,6 : PRINT#1,CHR$(X) : CLOSE 1

You can replace the X by any number from 1 to 144. Try 144 and your lines will be 1 inch each. 24 gives 6 lines per inch and 18 gives 8 lines per inch, and also can be used when doing a screen dump of graphics. I used 5 in my example program. Using 1 is a bit extreme, but try it to see.



```
1 D$=".............................."
2 S$="[60SPACE]"
10 OPEN 6, 4, 6 : REM SET LINE SPACING
20 PRINT#6,CHR$(5) : REM PIXEL MODE
30 CLOSE 6
100 OPEN 4, 4 : REM NORMAL PRINT MODE
110 FOR X=1 TO 30
120 :PRINT#4,LEFT$(D$,X);LEFT$(S$,2*(30-X));LEFT$(D$,X)
130 NEXT
140 FOR X=30 TO 1 STEP -1
150 :PRINT#4,LEFT$(D$,X);LEFT$(S$,2*(30-X));LEFT$(D$,X)
160 NEXT
199 CLOSE 4
```

Inside the 2040 Disk Drive

Jim Butterfield

Yes, you can look at the programs inside the 2040. But unless you're strong in machine language - and have a bit of hardware background - it won't make much sense.

There are two processors in there. One looks out toward the PET .. I'll call it the IEEE processor; the other looks in toward the disk mechanics .. this one I'll call the disk processor. Each processor has a completely different set of programs. The two processors talk to each other by sharing a little memory space: about 4K of RAM is common to both micro-processors.

The IEEE processor is relatively easy to look into. You have the M-R, or memory read, command which allows you to look at the whole 64K memory space of this processor. Not all of this is actually fitted with memory, of course. As far as I can tell, ROM occupies hex locations E000 to FFFF. There's RAM in zero page; and the RAM which is shared with the disk microprocessor comes in four chunks:
hex 1000 to 13FF, 2000 to 23FF, 3000 to 33FF, and 4000 to 43FF. The 6502 PIA chips seem to be in addresses $0200 to $03FF.

To analyze a completely unknown 650X program, you must start by inspecting locations $FFFA to $FFFF. This gives you the three main vectors, for NMI, Reset, and INT. As far as I can tell, NMI isn't used - the vector points at non-existent memory. Reset is of course used; in my 2040 it points at F480, and that's where the main code for initialization begins. It looks to me as if the interrupt line must be kicked by the IEEE ATN (attention) line: when I follow the vector (FDDE) in my machine, it looks like an IEEE handshake is taking place.

That's all very well for the IEEE processor, but how can you get a look at the inner, disk processor? I had trouble with this one, until one day I discovered that the IEEE processor can download the disk processor - via the shared RAM - and make it execute this new code! So all that's needed is a little program to tell the disk processor to copy part of its memory to the shared RAM space, where it can be examined by using the M-R command.

I couldn't get this to work, however, until I discovered the vital missing link. The shared RAM, which is seen at locations scattered from $1000 to $43FF by the IEEE processor, is seen in completely different locations by the disk processor! .. in this case, in consecutive locations from hex 0400 to 13FF. The hardware just "maps" the memory into a different location. I might never have spotted this if the memories had not overlapped; but a little rummaging around and tearing of hair showed that my early programs seemed to be putting data into the wrong buffer. Eventually, the penny dropped, and the system became clear.

I'm far from being able to give details about the inner secrets of the 2040. But with the enclosed DISK PEEK program, you too can rummage around in there - in either processor's memory space - and come up with interesting data.

One caution - Commodore can, and undoubtedly will, change the ROM programs of the 2040 from time to time. Don't assume that what you see will apply to all machines.

```
100 PRINT"[CLR]DISK MEMORY DISPLAY";
105 PRINT" BY JIM BUTTERFIELD"
110 DATA 77,45,87,0,18,16,162,0,189
120 DATA 157,64,06,232,224,16,208,245
125 DATA 76,193,254
130 FORJ=1TO9:READX:C$=C$+CHR$(X)
135 NEXTJ
140 FORJ=1TO11:READX:D$=D$+CHR$(X)
```

```
145 NEXTJ
150 PRINT"[DN]THERE ARE TWO PROCESSORS:"
160 PRINT"  1) THE IEEE PROCESSOR;"
170 PRINT"  2) THE DISK PROCESSOR;"
175 PRINT"WHICH DO YOU WANT TO PEEK ";
180 INPUT"(1 OR 2)";D
190 PRINT"INPUT MEMORY ADDRESS"
200 PRINT"IN HEXADECIMAL:":OPEN1,8,15
210 P$=CHR$(4)+CHR$(16):R$=CHR$(224)
220 PRINT"[2 SPACE,4 RIGHT,30 SPACE,UP]"
230 INPUTZ$
240 PRINT"[UP]";:IFLEN(Z$)<>4 GOTO220
250 FORJ=1TO 4:Y=ASC(MID$(Z$,J))
260 IFY<58THENY=Y-48
270 IFY>64THENY=Y-55
280 IFY<0ORY>16GOTO220
290 Y(J)=Y:NEXTJ:K=0:PRINT"[6 RIGHT]";
300 U=Y(3)*16+Y(4):V=Y(1)*16+Y(2)
310 IFD<>2GOTO360
320 PRINT#1,C$;CHR$(U)+CHR$(V);D$
330 PRINT#1,"M-W";P$;CHR$(1);R$
340 PRINT#1,"M-R";P$:GET#1,X$
345 IFX$=R$GOTO340
350 U=64:V=18
360 PRINT#1,"M-R";CHR$(U);CHR$(V)
370 GET#1,X$:IFX$=""THENX$=CHR$(0)
380 PRINT" ";:X=ASC(X$)/16
390 FORJ=1TO2:X%=X:X=(X-X%)*16
395 IFX%>9THENX%=X%+7
400 PRINTCHR$(X%+48);:NEXTJ
410 U=U+1:IFU=256THENU=0:V=V+1
420 K=K+1:IFK<8 GOTO360
430 Y(0)=0:Y(4)=Y(4)+8:J=4
440 IFY(J)<=15GOTO450
441 Y(J)=Y(J)-16:J=J-1:Y(J)=Y(J)+1
442 GOTO440
450 PRINT:PRINT"   ";
455 FORJ=1TO4:Y=Y(J):IFY>9THEN=+7
460 PRINTCHR$(Y+48);:NEXTJ
465 PRINT"[UP]":GOTO220
470 REM
480 REM *** IT MAY BE NECESSARY ON SOME
490 REM VERSIONS OF DISK TO CHANGE THE
500 REM LAST THREE ITEMS IN LINE 120
510 REM (76,193,254) TO THE RESET
520 REM SEQUENCE: 108,252,255.
```

New Product Announcement: ROM Switching for New Pets

Small System Services, Inc. has announced a family of ROM switching devices for the 16 and 32K Commodore PETs and CBMs. The central device is Spacemaker, a $27.00 unit that allows users to switch between address conflicting ROMs like the Toolkit and Word Pro II and III ROMs. Spacemakers may be daisy chained, allowing selection of multiple expansion ROMs. Other options allow ROM switching under software control. For more information contact your Commodore dealer or Small System Services, Inc., 900 Spring Garden St., Greensboro, NC 27403. (919)272-4867

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PET 2040 DUAL DISK DRIVE-343,000 bytes	$1295	$170
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PET 2023 Pressure Feed Printer	$ 849	$110
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Gene Beals
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Montgomeryville, PA 18936

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If you have a program to contribute to the list (one which we don't have, or an updated or enhanced version of an existing program), please send it on tape. We will save it for the exchange and return a program of your choice.

Due to the demise of PET User Notes, the Program Exchange has been sadly neglected. Everything will get going again, however, and there will be a number of new programs listed in the next issue.

We have also accumulated a number of four part harmony songs (for use with the various digital to analog boards). If you are interested in any of these, write for additional information.

So that no one is misled, I work at A B Computers. Although A B does attempt to sell some PET software, the Program Exchange is maintained on a completely separate basis.

Please write to me (Box 516, Montgomeryville, PA 18936) to request or exchange programs, or if you have any comments on the way the exchange is being conducted.

SPACE RACE - Matt Ganis -- guide your spaceship to the top of the box through randomly moving stars.
ACEY DEUCY - Matt Ganis -- you are dealt two cards and then bet whether your next card will be between the first two cards.
BOMBER - Matt Ganis -- destroy the city by dropping bombs on it. Lose points for each bomb and accumulate points for each hit.
MATH DRILL - William C. Anderson -- drill on addition, subtraction, multiplication, and division for numbers 1 through 12.
OPTI-STICKS -- combines optical illusions and graphics demo of sticks rolling down hill - nice demo.
TRACE-OLD ROM - Brett Butler -- self-relocating version
TRACE-NEW ROM - Brett Butler -- self-relocating version
LIFE 64*64 V.2 - Frank Covitz -- maintains symmetry through wrap around. Set for either growth or decay. Excellent machine language program.
HORSERACE - Stephen Erlewine -- very nice version partly in machine language for the animation.
MAZES - Stephen Erlewine -- creates single solution mazes of 3 different sizes for you to find your way through.
MATH QUIZ - Stephen Erlewine -- drills for addition and subtraction using large numbers on screen.
CRYPTOGRAMS - Stephen Erlewine -- create cryptograms. Solve ones you just created or one that you key in. Up to 5 lines long.
TAG - Stephen Erlewine -- 2 player game of tag. You try to tag your opponent when you're "it".
PIZZA - Stephen Erlewine -- primary grade educational game to help learn co-ordinates.
PAR-SER - Vikash Verma -- package of 3 programs to simulate a parallel to serial interface and to produce hard-copy on RS-232 printer. Note: counts as 2 programs. Includes 3 pages of listing and instructions.
KENO - Mel Fishman -- gambling number game.
BIORYTHM - E. Wuchter -- select either screen display or line printer output.
FLOPTRAN IV - Mark Zimmerman -- Floating Point Trranslator. Old ROM only.
SPACE NIM - Matt Ganis -- very nice graphics used to depict droids zapping fuel barrels from the piles.
STAR WARS THEME - J. Cannatta -- CB2 music.
CONVERSION - Bob Freeman -- converts from most anything to anything else (metric-decimal, etc.).
TYPING DRILL - Bob Freeman -- learn to use keyboard correctly.
SHARK BAIT - JK Johnson -- hangman style program
FLEA RACE - JK Johnson
AWARI - Hans-J Koch -- German instructions - nice graphics CHASE with Sound
STAR LANES - Gerald Hasty -- from Interface Age future-world business simulation
KALEIDOSCOPE - Jerry Panofsky -- People's Computers
HEXDEC - Wayne Reindollar -- converts and pokes values into memory for machine language programs
24 Second QUBIC - Mike Louder
DOODLER - Jim Brannan -- draw type program
GNIP GNOP - Jim Brannan -- 2 player ping pong
PONG - People's Computers
CURFIT - J. Butterfield -- fits data to 6 curves
TRIANGLE - J. Butterfield -- solves any triangle
METRIC - J. Butterfield -- does metric conversions
DATES - J. Butterfield -- day of week, days between
TRENDLINE - J. Butterfield -- fits, forecasts, graphs
MILEAGE - J. Butterfield -- distances from Latitude/Longitude
FACTORS - J. Butterfield -- prime factors for any number
MORTGAGE - J. Butterfield -- schedule of payments
FINANCE - J. Butterfield -- present, future value etc.
ADDER - Earl Wuchter - PET as printing adder (nicely done)
BATTLESHIPS - J. Butterfield -- you vs. computer
MOONLANDER - J. Butterfield -- graphics
CRYPTO - J. Butterfield -- cryptogram solving aid
JOTTO - J. Butterfield -- guess a word
POEMS - J. Butterfield -- write poetry
HIKONDIS - high monitor and disassembler from SPHINX. Modified by H. Chow. Old ROM
ELIZA - adapted for PET by Dennis Cumberton -- the computer psychologist
HAMMURABI - social simulation

SLOT MACHINE - Michael Richter
CRAPS - Michael Richter
BREAKOUT - with Sound
POP SHOT - from SPHINX -- shooting gallery with sound
STARS - John Broomhall -- children's number guessing game
LINEON - Frank Alexander -- solves linear equations using matrix invert subroutine.
POUNCE - John Broomhall -- kids game. If you don't pounce the right number of spaces, the mouse might run into his hole.
STAR WARS - John Broomhall
AUTO-DOODLE - Frank Levinson -- draws very nice rectangular patterns
FOURIER - Frank Levinson -- very nice high density graphing - visual demo of Fourier approximation curve fit.
CRAPS2 - Earl Wuchter -- not a crap game; rolls dice & displays statistics on the rolls. Shows odds, displays dice.
SOLITAIRE POKER - D Howe -- submitted by E. Herstein - solitaire version of draw poker. Displays odds as you play.
PRO FOOTBALL - Modified by Carl Hennig from SRI Library
RENUMBER - Bill Seiler -- machine language version - old ROM
MATCH GAME - L Uher -- 23 matches
STAR TREK IV - Francis Chambers -- updated version with good graphics and more features
BRAIN STRAIN - Ed Herstein -- difficult puzzle with good graphics.
SNAKE - submitted by Ed Herstein -- a 0,1, or 2 player Trap game that speeds up the longer you go.
YAHTZEE - Pete Rowe submitted by Ed Herstein -- dice game
HANGMAN - Grant Paul -- has list of 500 words
HANGMAN 2 - for 2 players with PET keeping score - needs a little work on display & graphics.
COPY - R. Julin -- data file manipulation
TALK & TALKER - R. Julin -- Send ASCII characters between 2 PETs via parellel user port.
LEM - Horst Brinkler -- lunar lander includes attitude, angle, and orbit consideration as well as time, altitude, & velocity. English or metric measurements. No graphics.
INDEX - David Wilcox -- tape index to locate a specific program on a tape.
KENTUCKY DERBY - Tom Baker -- Horse race for any number of people with betting - good looking horses.
MAZE - Hans-J Koch -- Creates a single solution maze up to 19*10. Use cursor keys to find way through.
FLIGHT SIMULATOR - submitted by Jerry Panofsky -- instrument flying. Try to take off and land safely.
BACKGAMMOM - Bill Hood -- palys decent game.
PPONG - P. Rowe submitted by Ed Herstein -- similar to deflection with land mines
FN MACHINE - P. Rowe submitted by Ed Herstein -- feed numbers through machine, see output, deduce function.
WEIGH - Guess the lightest and heaviest object in 3 tries.
KLINGON CAPTURE - Mark Turner -- grid game from KILOBAUD
SIMON - Gary Mayhuk -- sound repetition game
OTHELLO/2 - F. Dunlap Modified by J Mendenhall
DIGIT SPAN - number recall in sequence and reverse sequence for progressively long numbers.
CENTRAL LIMIT - Dave Heise -- graphs results of repeated samples of any given size, showing averages tend to be normally distributed.
CHI SQUARE - Dave Heise -- constructs repeated random 4-fold tables and computes significance test for each. Nice graphic representation of statistical values.

Editor's Note:
COMPUTE is excited about the PET Software on Tape Exchange. Gene and his staff are taking on an awsome workload. Please address all PET Tape Exchange correspondence to Gene in Montgomeryville. If you're interested in a Tape Exchange for other machines, like Atari or OSI, write directly to me: Robert Lock, COMPUTE, Post Office Box 5119, Greensboro, NC 27403.

Some Exchange guidelines:

1. *The Exchange is intended to promote the sharing of user generated software.*
2. *Be very careful that you submit only your own, original work to the exchange. Matters of copyright remain the sole responsibility of the individuals submitting the program. We accept no liability, express or implied. Do not submit modified (or unmodified) commercial software to the Exchange. It makes their job much harder. We make every effort to screen software; we will appreciate our readers' efforts to do the same.*
3. *We do not intend to promote the Exchange as a competitor to commercially available software. You'll find that commercial software is generally much more polished and documented than what you'll receive from us.*

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Review: BATTER UP!

$10.95, Hayden Book Company, Inc.
50 Essex Street, Rochelle Parks, NJ 07662

Review by Carl Strobel
1716 Tarleton Way
Crofton, MD 21114

If you, like me, have sworn off purchasing any more commercial game software and you're bored with the multiplicity of computer programs which test your skill in hitting targets, deflecting balls and the like, you'll understand the skepticism with which I approached this game.

I was totally fascinated and bought it after 45 seconds. The graphics alone are worth the price of the program. With imaginative use of the PET graphics set, the game displays a pitcher in his windup, a swinging batter, an outfielder in front of the bleachers (watch him when he misses the ball), and a Goodyear blimp-view of the diamond as the runners advance.

The result is a vivid, realistic and thoroughly enjoyable game which shows what an imaginative programmer like Karl Savon can accomplish on the PET.

Typical of the thought that went into the game is the running box score, which not only shows hits and runs, but also tallies strikeouts and calculates each pitcher's ERA.

One player can release the pitch while the other decides to swing high or low, or take the pitch. Or it can be a one-player game. At a recent club demonstration, in which BATTER UP! was a definite hit, it took new players two or three innings to get the feel of swinging the bat.

Shortcomings? A minor annoyance is the fact that team names are limited to five letters. Thus a replay of the World Series had to feature the Bucs against the Birds.

The program is not protected, which is a plus. I

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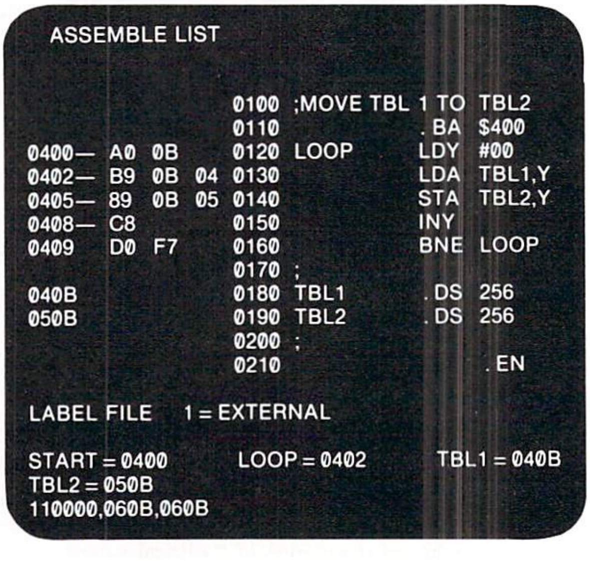

```
ASSEMBLE LIST

                     0100 ;MOVE TBL 1 TO TBL2
                     0110            .BA  $400
0400— A0  0B         0120 LOOP       LDY  #00
0402— B9  0B  04     0130            LDA  TBL1,Y
0405— 89  0B  05     0140            STA  TBL2,Y
0408— C8             0150            INY
0409  D0  F7         0160            BNE  LOOP
                     0170 ;
040B                 0180 TBL1       .DS  256
050B                 0190 TBL2       .DS  256
                     0200 ;
                     0210                 .EN

LABEL FILE    1 = EXTERNAL

START = 0400         LOOP = 0402          TBL1 = 040B
TBL2 = 050B
110000,060B,060B
```

was able to make a copy for regular use and keep the original safely locked up. Since I'm an inveterate software tinkerer, I also plan to introduce a random factor which will occasionally allow a runner on first to advance to third on a single, or a runner to move up one base on a long fly.

BATTER UP! has all the appeal of a real ballgame, everything but the peanuts and Crackerjacks.

REVIEW: PLEXI-VUE

(High-Contrast Viewing Screen)

Competitive Software
21650 Maple Glen Drive
Edwardsburg, MI 49112
$14.95

Review by
Arthur B. Hunkins
School of Music
UNC-G
Greensboro, N. C. 27412

I often spend eight hours or more a day at my PET. Before PLEXI-VUE I suffered from a severe case of eye fatigue, even with the brightness control at minimum. Today, eye strain is a thing of the past, while screen contrast and clarity are improved. PLEXI-VUE is a great boon to anyone spending much time staring at a PET CRT.

The PLEXI-VUE also helps, I am told, with the new green CRT's. The smoked plexiglass darkens everything behind it, making the PET much "classier." The dressy effect resembles that of a Teleray terminal.

In the wrong light, the surface can glare and show dust and scratches. (Its shiny surface tends to reflect like a dark mirror.) Positioning the PET differently minimizes these problems.

PLEXI-VUE is designed for easy, permanent installation (no tools or supplies required). Its $14.95 price tag is steep for a single piece of smoked plexiglass, but considering the long-term benefits in eye strain reduction, PLEXI-VUE is a worthwhile investment for the devoted PET handler.

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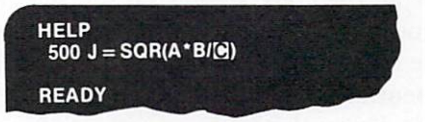
AUTO
HELP
OFF
FIND
RENUMBER
TRACE
APPEND
DELETE
STEP
DUMP

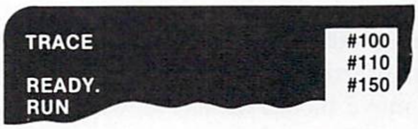
Every one a powerful command to insure more effective programming. Like the **HELP** command that shows the line on which the error occurs ... and the erroneous portion is indicated in reverse video:



```
HELP
 500 J = SQR(A*B/C)

READY
```

... Or the **TRACE** command that lets you see the sequence in which your program is being executed in a window in the upper corner of your CRT:



```
TRACE                              #100
                                   #110
READY.                             #150
RUN
```

The **Programmer's ToolKit** is a product of Harry Saal and his associates at Palo Alto ICs.

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Review: Text Cast

J. A. Dilts

Department of Chemistry
University of North Carolina at Greensboro
Greensboro, NC 27412

In reviewing the Textcast word processor program from Cognitive Products of Chapel Hill, NC, I will be comparing this product with two other word processors that I am familiar with, specifically the text editor available on the Hewlett-Packard 2000 access system and one of the first word processing programs for the PET, Connecticut Micro computer's WWP package.

Each of these two programs tend to be ''line'' oriented and this presented a major difference in getting used to Textcast. The most striking feature that distinguishes the CMC word processor from Textcast is that the former requires additional memory for any work above a short letter. The Textcast program uses a screen orientation so the entire text is not in memory at one time. This allows for creation of an unlimited volume of text, even within the confines of a 8K of RAM.

Another important difference between the two word processing programs written for the PET is that Textcast uses a number of machine language routines which make it somewhat faster in terms of seeing the copy appear on the screen while in the process of entering the text. Being page oriented, the Textcast program does not require any attention to line length and one can essentially type in continuously as one would normally. Line length is controlled by Textcast at time of entry and when print out is required.

Several key functions, I.E. cursor movements and space (to name but two), have a repeat action which makes using these features for on-screen editing a joy. Although there is provision for inserting lines in the text, it is not as easy to move blocks of text as with the CMC word processing package. Neither of these programs has a search feature. Textcast has a fast forward feature which does aid in this process however. The overall speed gives Textcast a definite advantage.

I was somewhat doubtful about the utility of this program with an 8K system using cassette storage, but I found it quite satisfactory. I should mention that to use all of the features programmed in this package one should have an outboard cassette for use in file editing.

One of the many sophisticated features of this program is the ability to pack a paragraph so that if you hit return, leaving blank lines at the end of a line of text, they will automatically be compacted. It goes without saying that if one wants to use such software in a serious manner, a standard typewriter type keyboard is rather important!!! The Skyles keyboard works well, but others may not (I have experienced some difficulties with some external keyboards with CMC's word processor and anticipate that I would have the same difficulties with keyboards that attempt in hardware to act like a normal typewriter keyboard). One problem with the NEECO keyboard is it's locking shift key, e.g. there is no option.

In general I would say Textcast offers the features of most major word processing programs and does so within the limits of an 8K machine. This in itself is amazing. The CMC word processor offers a somewhat more flexible means of moving blocks of text, but is not as fast. While the CMC program depends on editing line by line, Textcast operates on a screen basis and by doing so, takes advantage of the on-screen editing capabilities of the PET.

Documentation for both processors is done quite well, but like any moderately complex program, to be really sure that the system is going to do the job, you must actually use it. Although the instruction booklet for the Textcast program is quite complete, it appears somewhat imposing if you attempt to make any sense out of it without trying actual hands-on experience. The fact that this review was composed using this processor is testimony to its ease of use.

The most impressive thing I have found is a combination of speed coupled with the ability to produce a working word processing package in an 8K micro. There was one small problem encountered with using Textcast with a Dec terminal in that this device does not generate it's own line feed as many printers do. The fix for this problem involved three simple changes in the program and are relatively easy to make. This item of software is highly recommended to anyone with a printer who is really interested in doing word processing on a limited budget.

HELP!

Congratulations and many thanks to Jim Butterfield for his excellent article entitled ''Un-Crashing On Upgrade ROM Computers''. It was shown to me by a friend and caused me to take out a subscription to Compute. I soldered long, flexible leads to the appropriate pins on the back side of the circuit board, and connected them to a home-made switch which consists of a stiff strip of metal (bottom), connected to RESET, a flexible, elastic strip of metal (center), connected to ground, and another elastic strip of metal (top), connected to the SENSE line. The metal strips are attached to each other by small pieces of Lucite at one end, and if pressed, make the two contacts in the right order.

The procedure works well with "type 3" crashes. Unfortunately, the new "Professional Computer" is also beset with crashes # 4 and 5:

Crash #4: This can happen at any time (even without fooling around with machine language), but is best reproduced by loading Jim Russo's "Fast Graphics" written for the 8K PET, and trying to RUN it. The result is B* and the Monitor Registers. SP = F8.

Type X. You'll get READY and a flashing cursor. Type in any command, e.g. LOAD, LIST, ?FRE(0), or whatever, and you will get the same Register display, except that SP = F6. The next time, it will be F4, and so on. There is no way out of this, except a power-on, or BASIC (memory check) reset with all memory lost.

Crash #5: This is very similar to #4, but adds insult to injury. Occasionally, it happened even on my old 8K PET. No commands are obeyed, because everything is answered by ?SYNTAX ERROR. Here again, one can follow the UN-CRASH procedure, and obtain the READY and cursor, but the appearance of normalcy is an illusion, and ordinary resetting is required.

If anyone has a cure for this other than buying a different computer, PLEASE let me (and everyone else) know. Thank you.

Anselm Wachtel
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THE SBC GAZETTE

We are very pleased to welcome Eric to the pages of COMPUTE. He provides a valuable perspective to the SBC Gazette. Welcome to you *6502 User Notes* readers as well. COMPUTE's a resource magazine and I solicit your help and input on the SBC Gazette. Letters, articles and comments should be sent to my attention at COMPUTE, Post Office Box 5119, Greensboro, NC 27403. With your input we'll maintain a growing, active SBC Gazette. For information on back issues of *6502 User Notes,* see COMPUTE's Book Corner on page 97.

Robert Lock, Editor

The Single-Board 6502

Eric Rehnke

For those of you who are looking at single-board 6502 systems, let's start this column off with a rundown of four of them.

KIM, AIM, SYM & SUPERKIM — Which ones' for you?

If you're looking around at 6502 single board computers and aren't quite sure which way to turn-lets examine the facts.

All four machines are similar in that they use the 6502 as the CPU and each is a complete "system-on-a-board" but that's where the similarity ends.

Software is not usually transportable among these systems because each has a different Input/Output scheme.

The only exception to this is the KIM and SUPERKIM. Since SUPERKIM is an enhanced system based on the KIM ROM set, all KIM software is useable on either of these machines. More on SUPERKIM later.

KIM-1: (This machine started it all) KIM has 1 K RAM, 2K ROM (contains operating software), calculator style keyboard and display, cassette and TTY interfaces, and 15 I/O lines which are available to the user. No on-board expansion capability is provided. This machine has been on the market about four years and is still a very reasonable entry-level system since the price has been reduced to the $150-$180 range.

There is a lot of software available for KIM since it's been around the longest. Several high-level languages such as Microsoft BASIC, Tiny Basic, FOCAL, FORTH, XPLO (a Pascal-like compiler) and as many assemblers make KIM a very good choice as the CPU in an expanded 6502 based system. Also there are at least one each full size and mini size floppy disc systems available as well as EPROM programmers, video boards, graphic display boards, etc., etc.

Going with KIM makes good sense if you're just starting out and want to get by cheaply, want to learn about micros from the ground up, plan on building a rather large 6502 machine as a development system, or maybe to run one or more higher level languages. Oh, and there's a 4800 baud cassette interface (software & hardware) available for KIM (around $25.00) that will turn your cassette interface into sort of a poor man's floppy.

KIM is not very suitable for industrial and laboratory process control or data gathering since in these applications the use of EPROM and added I/O capability is essential. An additional board would have to be constructed to support the added capability necessary for KIM to be a good controller.

The KIM-1 is manufactured by Commodore Business Machines, Palo Alto, CA., and is available through local dealers and mail order outfits such as Jade and Advanced Computer Products.

SUPERKIM should be discussed next because it is based on the KIM-1 design, but with some rather significant additions. Lots of on-board I/O, EPROM, and RAM expansion is available. SUPERKIM comes with 1K of RAM (expandable to 4K on-board), sockets for up to 16K of on board EPROM, three 8-bit I/O ports with sockets for three additional 6522 VIAs, on-board regulator, 8 priortized interrupt inputs, lots of prototyping area plus all of KIMs features mentioned in the previous section.

The relatively high price of SUPERKIM ($375) makes it unsuitable as an entry-level system for the casual hobbyist. It would, however, make an excellent entry-level system for someone who expects to get serious about putting a micro computer to work and wants to learn all about it from ground zero. Also, because of SUPERKIMs on-board expansion and prototyping capability, it's very suitable for low-volume controller duty or whereever you need to get a computer up and running on the job quickly. SUPERKIM is not, however, a good choice for building up a large (16-64K) 6502 based system.

SUPERKIM is manufactured by MICRO PRODUCTS, 2107 Artesia Blvd., Redondo Beach, CA 90278. (213) 374-1673.

The **SYM** was designed to be an enhanced KIM style machine with all of KIM's features plus additional on-board I/O, RAM and EPROM espansion capability.

One problem that I have with SYM is that it was promoted as having a closer compatability with KIM hardware & software than it actually has. Mods which aren't even mentioned are needed to let SYM use KIM expansion hardware and the SYM keyboard/display routines are handled totally different than KIM. Converting software from KIM to SYM is not a job for beginners.

SYM does have some monitor functions which KIM doesn't have such as block move and fill, and a relative branch calculator but these advantages are more than offset by the fact that the SYM cassette and TTY interfaces fall very short of even working as well as KIM's I/O.

(Editor's Note: Synertek's new Mon 1.1, soon to be standard on all SYM-1's, clears up many of these problems. RCL)

The SYM is a classic example of a machine which was designed to do everything and ends up not doing anything all that well.

At its new price of $239, SYM would make an inexpensive dedicated controller system if everything could be done onboard. If more capability is needed, the SUPERKIM would make a better choice.

Optional BASIC and Assembler ROMs are available, but an ASCII terminal is necessary to use them.

The KIM-1 would still be the better choice if substantial system expansion was planned.

SYM is manufactured by SYNERTEK Systems, POB 552, Santa Clara, Ca 95052 (408) 988-5600. It's available through local dealers and mail order outfits such as RNB Enterprises, Jade, and Advanced Computer Products.

The **AIM 65** from Rockwell is a bit different from the previous systems because the AIM comes equipped with a full size ASCII keyboard, a 20 character wide LED display and 20 column thermal printer. Besides the usual monitor, and cassette and TTY interfaces, AIM 65 comes equipped with a mneomic entry psuedo-assembler, a text editor and some trace routines which really improve debug procedures.

There are also BASIC and Assembler ROM options available which make a lot of sense in this case because they both can be used with AIM's built-in keyboard and display/printer. On-board RAM should be expanded to the full 4K limit with either or both of the ROM options installed to take full advantage of the increased system capability.

AIM makes a good entry-level system for someone who wants the added dimension of ASCII input/output (instead of the calculator-style I/O on the KIM, SUPERKIM, and SYM) which alleviates the need for purchasing a separate ASCII terminal to use with BASIC or the Assembler ROM options.

AIM (with the Assembler and 4K RAM options) also makes a livable development system for programs up to about 1K long. Much beyond that, the small display and printer start becoming annoying and assembler listings are hard to read.

An area in which AIM is hard to beat is in controller applications where the keyboard, display and printer are essential such as when operator input is required or where data output is needed. Here is where AIM really shines. Three EPROMS may be added to the bare AIM.

Stay away from AIM, however, where significant amounts of system expansion are necessary. The extra money that you paid for the on-board display and printer will be wasted when a terminal and full size printer become needed.

For a portable, full featured machine with no foreseeable need for off-board expansion, AIM is a good buy.

AIM's TTY interface works almost as well as KIM's.

AIM 65 is manufactured by ROCKWELL International, Microelectronics Devices, POB 3669-RC 55, Anaheim CA 92803 (714) 632-3729.

WHATEVER HAPPENED TO THE "STANDARD" KIM BUS?

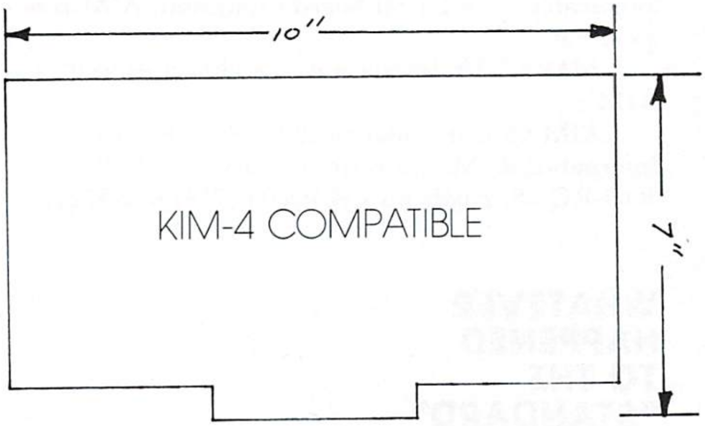
The KIM-4 (44-pin) bus as originally defined by MOS Technology/Commodore is the only bus that was designed specifically for KIM. Unfortunately, Commodore never seriously supported the bus and most folks went their separate ways to expand KIM.

Three companies are presently supporting expansion systems which are based "more-or-less" on the KIM-4 bus definition. They are: Hudson Digital Electronics, RNB Enterprises and Seawell Marketing. I say more or less because not one of the companies products corresponds exactly to both the KIM-4 electrical and mechanical specs.

Let's take a look at the KIM-4 pinout and board size.

KIM-4 BUS PINOUT

COMPONENT SIDE			WIRING SIDE
GROUND	1	A	GROUND
SYNCH	2	B	ADDRESS BIT 0
$\overline{\text{RDY}}$	3	C	ADDRESS BIT 1
$\overline{\text{IRQ}}$	4	D	ADDRESS BIT 2
-16 V. UNREGULATED	5	E	ADDRESS BIT 3
$\overline{\text{NMI}}$	6	F	ADDRESS BIT 4
$\overline{\text{RST}}$	7	H	ADDRESS BIT 5
DATA BIT 7	8	J	ADDRESS BIT 6
DATA BIT 6	9	K	ADDRESS BIT 7
DATA BIT 5	10	L	ADDRESS BIT 8
DATA BIT 4	11	M	ADDRESS BIT 9
DATA BIT 3	12	N	ADDRESS BIT 10
DATA BIT 2	13	P	ADDRESS BIT 11
DATA BIT 1	14	R	ADDRESS BIT 12
DATA BIT 0	15	S	ADDRESS BIT 13
BDSEL ••• (N/C)	16	T	ADDRESS BIT 14
+16 V. UNREGULATED	17	U	ADDRESS BIT 15
$\overline{\text{DMA}}$	18	V	02 CLOCK
+8 V. UNREGULATED	19	W	R/$\overline{\text{W}}$
+8 V. UNREGULATED	20	X	$\overline{02}$ CLOCK
+5 V. ••• (N/C)	21	Y	+5 V. ••• (N/C)
GROUND	22	Z	GROUND



You'll notice that the pins at positions 16, 21, and Y have signal definitions but are not connected. These signals were used when a single board was attached directly to a KIM-1 without using a KIM-4 motherboard.

Hudson Digital Electronics is the only one of the three companies whose boards are truly electrically KIM-4 compatible. But HDE's boards, are 4.5'' x 6'' which differs from the normal 7''x10'' KIM-4 compatible board size. (Now I happen to like the HDE card size a whole lot and feel that it makes more sense, but I own an HDE expanded KIM system so I'm probably prejudiced).

The boards from RNB Enterprises can be made fully KIM-4 compatible (mechanically and electrically) by installing a +5 volt regulator on their boards. (RNB regulates the whole bus instead of providing regulators on each card as in a normal KIM-4 system.) Whether this is better or not is debatable. However, RNB does provide a place on the board to install a regulator so this is not much of a problem.

Seawell Marketing has made the following reassignments to the KIM-4 bus:

PIN #	OLD SIGNAL	
16	BDSEL	$\overline{\text{EX CLOCK}}$
21	+5	+8
Y	+5	BANK SELECT
X	$\overline{02}$	01

Since 01. is not necessarily equal to 02, there could be problems when using the Seawell motherboard with non-Seawell expansion boards. You see, clocks very rarely have a perfect 50% duty cycle. Also, if you try to use an electrically KIM-4 compatible board in the Seawell backplane, the voltage regulator on the expansion board will have a very heated debate with itself. It's output has been shorted to its input by pin 21 on the backplane which has been changed from +5 to +8 (on a KIM-4 compatible board the output of the on-board regulator also goes to this +5 volt connection). The solution to this problem is simply to cut the trace from the regulator to the 5 volt output connection on the card BEFORE it's installed in the Seawell backplane. Seawell also sells a prom programmer board and a very nice looking 16K static RAM board.

So everyone sort of went their own way with their KIM expansion efforts. HDE changed the card size but kept electrical compatibility. RNB and Seawell use the normal card size but RNB pulled the regulators off their expansion boards, and Seawell redefined some of the bus connections.

Watch your step before you get on the bus.

What's Happening?

Hudson Digital Electronics has purchased source-code rights to Microsoft BASIC. They are in the process of turning it into a full-fledged disc BASIC and have added some neat features up to this point.

They've already added a line edit capability, line move, line copy, line and file append (file append also resequences the line numbers in the appended file so duplicates don't occur), a file delete, and a capability for loading machine language programs off disc (that would eliminate the problem of having

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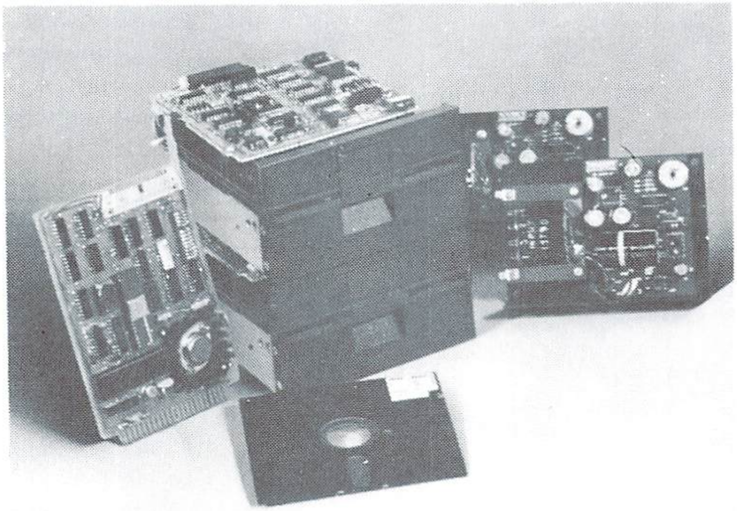
THE HDE MINI-DISK SYSTEM



VERSIONS

KIM	AVAILABLE
TIM	AVAILABLE
AIM 65	– 1st Qtr. '80
SYM	AVAILABLE

SINGLE DRIVE	$ 795.00
DUAL DRIVE	$1195.00

Complete with all hardware. Interconnecting cables, FODS, text editor and user and installation manuals.

The HDE DM816-MD1 Mini Disk System is the peripheral you have been waiting for. No longer bounded by long and unreliable cassette saves and loads, your computer becomes a sophisticated system for program development or general purpose use. With the HDE Mini-Disk you load and save programs in seconds, not minutes or hours. And, since all transfers to and from the Mini-Disk are verified for accuracy, the data will be there when you need it.

The HDE DM816-MD1 Mini-Disk has been "systems" engineered to provide a complete and integrated capability. Software and hardware have been built as a team using the most reliable components available. The systems software includes the acclaimed and proven HDE File Oriented Disk System and Text EDitor, requiring only 8K for the operating software and overlay area. Systems expanding programs available include the two-pass HDE assembler, the Text Output Processing System and Dynamic Debugging Tool. Hardware includes a Western Digital 1771 based controller in a state-of-the-art 4½ x 6½″ card size, Shugart SA 400 drive and the Alpha power supply.

The storage media for the DM816-MD1 is the standard, soft sectored 5¼″ mini diskette readily available at most computer stores, and HDE has designed the system so that the diskettes rotate only during disk transactions, favorably extending media life. A disk formatter routine included with the system, formats the diskettes, verifies media integrity by a comprehensive R/W test and checks drive RPM. Additional utilities provide ascending or descending alpha numeric sort, disk packing, text output formatting, file renaming, file addressing and other capabilities.

HDE PRODUCTS. BUILT TO BE USED WITH CONFIDENCE.

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Medina, Ohio 44256
216-725-4560

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Audubon, Pa. 19407
215-631-9052

PLAINSMAN MICROSYSTEMS
Box 1712
Auburn, Ala. 36830
800-633-8724

LONE STAR ELECTRONICS
Box 488
Manchaca, Texas 78652
612-282-3570

PERRY PERIPHERALS
P.O. Box 924
Miller Place, N.Y. 11764
516-744-6462

to convert machine language programs to a string of DATA statements for incorporation into BASIC).

The release version of HDE BASIC will also include the capability for disk file handling and a few other goodies. For more information, contact HDE Inc. P.O. Box 120, Allamuchy, N.J. 07820 (201) 362-6574.

Synertek is now offering a monitor upgrade for the SYM microcomputer board. The new monitor ROM (MON-1.1) sells for $15.00 and is supposed to clear up some of the problems with the original monitor. According to a source at the factory, a new monitor listing is included as well as some discrete parts to improve the cassette interface.

Get more info from: SYNERTEK SYSTEMS, 150 S. Wolfe Rd., Sunnyvale, CA 94086 (408) 988-5689.

SYM owners will have a newsletter written especially for their systems. It's called SYM-PHYSIS and is being done independently of SYNERTEK. The introductory issue contains useful information and programs that should prove useful to you SYM owners. Six issues cost $9.00 in North America ($12.00 otherwise) and is available from :
SYM User Group, P.O. Box 315, Chico CA (916) 895-8751.

AIM users will be happy to hear that Rockwell will be publishing a newsletter especially for them. The first issue looks very good (I ought to know since I'm editing it!) and should be out in January. It's called INTERACTIVE, will cost $5.00 for 6 issues, and is available directly from Rockwell.

Newsletter Editor, Rockwell Microelectronics,
P.O. Box 3669 - RC 55, Anaheim CA 92803.

6502 Software Situation

When I got my KIM, I really wasn't sure what software was. When I finally found out what it was, I couldn't find any around.

Now that was awhile ago (seems like ages) and things have improved quite a lot since then.

(You know you've arrived when Microsoft writes a version of BASIC for your machine.)

Two years ago, I predicted that in two years (e.g. now) the amount of software available for the 6502 "would surpass that available to the 8080. Well. . . . . .was I right? I'm asking you 'cuz I don't know.

I haven't seen a Fortran or C compiler for the 6502, but, there is FORTH and XPL0. . .and Rockwell sells a compiler they call PL/65 (I guess PL stands for Programming Language). There still isn't any widely supported disc operating system for the 6502 on the order of C/PM which runs on the 8080/Z80. (I feel that the lack of a standard 6502 hardware configuration has been largely responsible for this problem.)

Hudson Digital Electronics has recently crossed the hardware barrier by adapting their disc operating software to the S-100/KIMSI environment. So KIMSI owners can now use all that good HDE software that's available. While the present HDE disc software is not oriented towards the small business environment, they do provide the most complete collection of 6502 system development software available anywhere.

To sum it up: there are several good assemblers and high-level languages available for 6502 machines but, unless you own an APPLE or a PET, not much in the way of application software.

If you're using the 6502 in dedicated systems (it really shines in that area) you're in a "pioneer mode" anyway since you have to write all your own application software. In this mode you're more interested in the ease of programming and interfacing that the 6502 offers and not in how many game programs are available.

SYNERTEK SYSTEMS CORPORATION (150 South Wolfe Road, Sunnyvale, CA 94086) has announced the availability of a new Micro Development Tool for users of the 6500 series microprocessor family. The new product, called the MDT 1000, enables the user to write programs and debug both hardware and software.

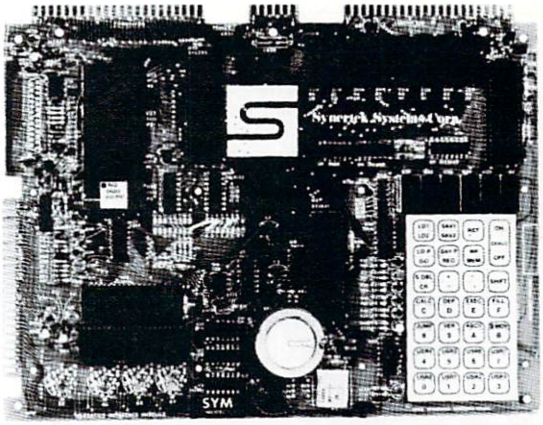
According to the company, the MDT 1000 includes the following hardware: 54-keyboard and case; 12 inch (black/white) video monitor; dual cassette interface; power supply; EPROM Programmer; 4K byte static RAM board; CPU board with both serial and parallel printer interfaces; video interface; sockets for four ROMs, system RAM and ACIA for serial communications; and a four slot motherboarcd with two sockets installed.

Software support for the MDT 1000 comes as 12K bytes of ROM-resident firmware; a 4K monitor with debug features; and an 8K byte assembler/editor which operates on line-numbered text. An 8K floating-point BASIC in ROM is available as an option. Additional software is provided for CRT control, printer interfacing, dual cassette interfacing, EPROM programming and keyboard. Additionally, the hardware is fully compatible with Motorola's EXORcisor™ bus to facilitate easy expansion. The MDT 1000 carries a unit price of $1495 and deliveries are being made now.

SYM-1, 6502-BASED MICROCOMPUTER

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY

  The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.
- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes.
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
  - —Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
  - —Full duplex 20mA Teletype Interface
  - —System Expansion Bus Interface
  - —TV Controller Board Interface
  - —CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL Lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD



Synertek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately.

SYM-1 Complete w/manuals	**$229.00**
SYM-1 User Manual Only	**7.00**
SYM-1 Expansion Kit	**60.00**

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand.

SYM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON. Expansion features that are available:

BAS-1 8K Basic ROM (Microsoft)	**$ 89.00**
KTM-2 (Complete terminal less monitor)	**319.00**

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1 & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. *All boards carry full 90-day warranty.*

All products that we manufacture are designed to meet or exceed industrial standards. All components are first qualtiy and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a $10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard	**$129.00**

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 RAMs is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only 8K of RAM (½ populated)	**$239.00**
VAK-3 Complete set of chips to expand above board to 16K	**125.00**
VAK-4 Fully populated 16K RAM	**325.00**

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and ±12 VDC, but has a DC to DC multiplyer so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 EPROM Programmer w/2708 adapter	**$249.00**
VAK-5A Single voltage 2716 adapter	**45.00**

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. *EPROMs not included.*

VAK-6 EPROM Board	**$119.00**

VAK-7 COMPLETE FLOPPY-DISK SYSTEM (Oct '79)

VAK-8 PROTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Protyping Board	**$39.00**

POWER SUPPLIES

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SYM-1 Message Scroller

A. M. Mackay

600 Sixth Avenue, West
Owen Sound, Ontario
N4K 5E7

Here's a little program to show off the SYM-1. It will scroll any message indefinitely.

The message can be any length, as long as SYM's memory holds out. The program runs at 0200. The message is entered starting at 0260, and must end with five "00"'s, then "FE". The character segment code is as shown on P. 18 of 6502 U.N. #14. The scrolling speed can be varied by changing the value at 0224.

The program uses Zero page locations 00, 01, and, for no good reason, 03. I interchanged "m" and "n" as shown in Stan Ocker's article in KUN #1, since the SYM-1 uses the small character " " as a "memory" prompter.

Thanks for your work, and the "First Book of Kim". Without them, my machine would still be doing nothing except stare at me.

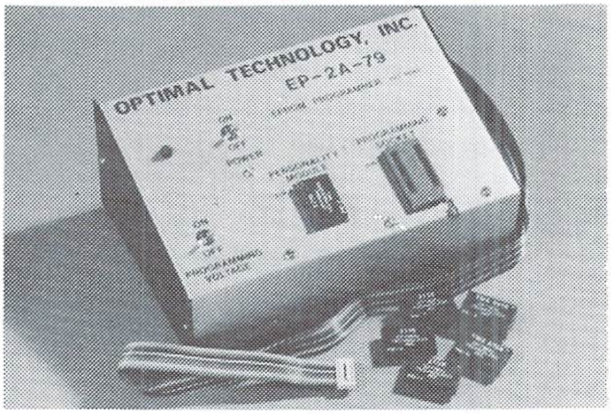
```
                0010 ;SCROLLING PROGRAM
                0030 ;BY A. M. MACKAY
                0040 ;
                0050 ACCESS     .DE $8B86
                0060 DISBUF     .DE $A640
                0070 SCAND      .DE $8906
                0080 WINDOW     .DE $25B
                0090 TDLY/64    .DE $A41E
                0100 IFR        .DE $A405
                0110 CNT1       .DE $0
                0120 CNT3       .DE $3
                0130 MASK       .DE $80
                0150 ;
                0160            .BA $200
0200- 20 86 8B  0170            JSR ACCESS
0203- A2 04     0180            LDX #$04
0205- A9 00     0190            LDA #$00
0207- 9D 5B 02  0200 BLOOP      STA WINDOW,X
020A- CA        0210            DEX
020B- 10 FA     0220            BPL BLOOP
020D- A9 5B     0230 SET        LDA #$5B
020F- 85 00     0240 TADL       STA *CNT1
0211- A9 02     0250            LDA #$02
0213- 85 01     0260 TADH       STA *CNT1+1
0215- A0 05     0270 START      LDY #$05
0217- B1 00     0280 GETCH      LDA (CNT1),Y
0219- C9 FE     0290            CMP #$FE
021B- F0 F0     0300            BEQ SET
021D- 99 40 A6  0310            STA DISBUF,Y
0220- 88        0320            DEY
0221- 10 F4     0330            BPL GETCH
0223- A9 1A     0340            LDA #$1A
0225- 85 03     0350 COUNT      STA *CNT3
0227- A2 FF     0360 DLY        LDX #$FF
0229- 8E 1E A4  0370            STX TDLY/64
022C- 20 06 89  0380 DISPL      JSR SCAND
022F- A5 80     0390            LDA *MASK
0231- 2C 05 A4  0400            BIT IFR
0234- 10 F6     0410            BPL DISPL
0236- C6 03     0420            DEC *CNT3
0238- A5 03     0430            LDA *CNT3
023A- 10 EB     0440            BPL DLY
023C- E6 00     0450            INC *CNT1
023E- F0 03     0460            BEQ INTADH
0240- 4C 15 02  0470            JMP START
0243- E6 01     0480 INTADH     INC *CNT1+1
0245- 4C 15 02  0490            JMP START
                0500 ;
                0510 ;ALPHABET
                0520 ;VALUES ARE IN HEX
                0530 ;
                0540 ;A=77    ;B=7C    ;C=39
                0550 ;D=5E    ;E=79    ;F=71
                0560 ;G=3D    ;H=76    ;I=06
                0570 ;J=1E    ;K=70    ;L=38
                0580 ;M=54    ;N=37    ;O=3F
                0590 ;P=73    ;Q=67    ;R=50
                0600 ;S=6D    ;T=78    ;U=3E
                0610 ;V=6A    ;W=1C    ;X=14
                0620 ;Y=6E    ;Z=C9
                0630 ;.=80    ;SPACE=00
                0640 ;

                0650 MESSAGE      .BA $260
0260- 6D 3E 7C  0660              .BY $6D $3E $7C $6D $50
0263- 6D 50
0265- 06 7C 79  0670              .BY $06 $7C $79 $00
0268- 00
0269- 78 3F 00  0680              .BY $78 $3F $00
026C- 39 3F 54  0690              .BY $39 $3F $54 $73 $3E
026F- 73 3E
0271- 78 F9     0700              .BY $78 $F9 ;$F9="E"+"."
0273- 00 00 00  0710              .BY $00 $00 $00 $00 $00
0276- 00 00
0278- FE        0720              .BY $FE
                0730              .EN
```

misspelled 58~c

subscribe to compute

EPROM PROGRAMMER — Model EP-2A-79



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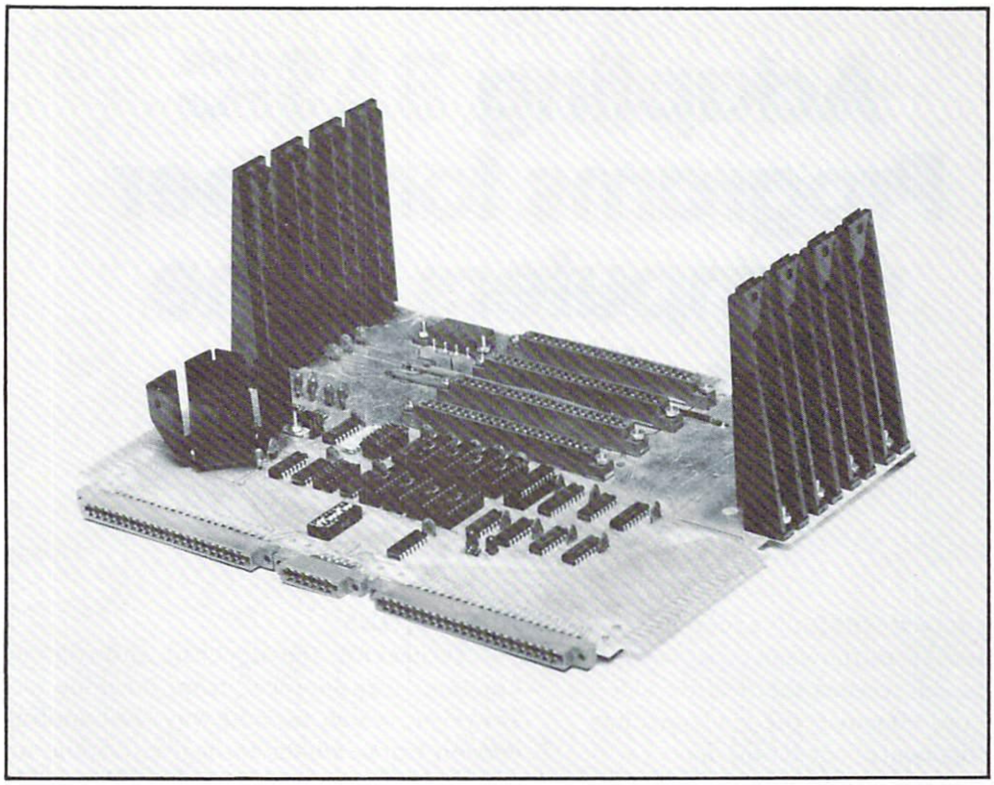

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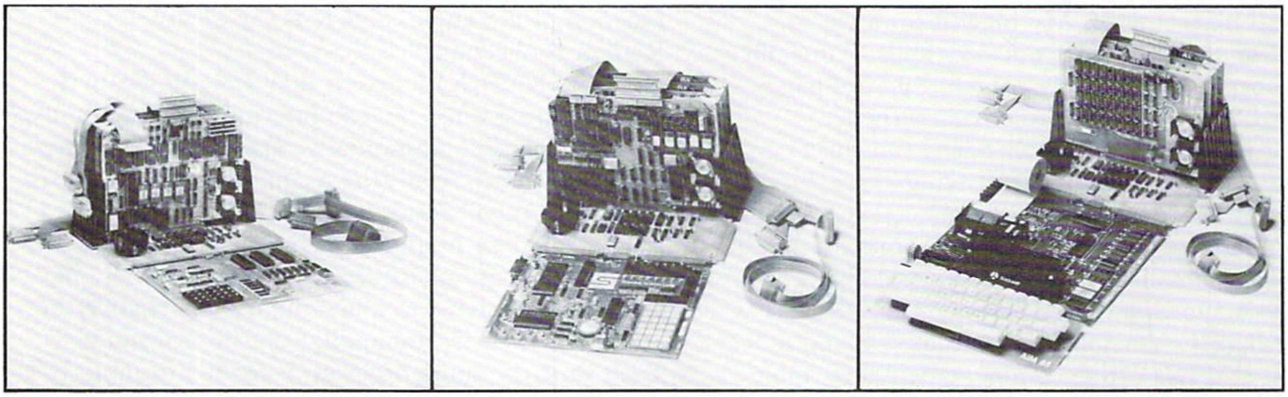

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Adapting BASIC Programs for Other Computers to the Challenger 1P

Charles L. Stanford
2903 Georgetown Road
Cinnaminson, N. J. 08077

Like most owners I've talked with, my experience with the OSI Challenger 1P in the year or so we've been together has been well toward the positive side. The hardware is neat and effective, the keyboard has a good feel, and the "firmware" in ROM has allowed great ease and versatility in programming. A recent upgrade to 8K of RAM has more than doubled program storage space, opening many new doors. Granted, the lack of documentation and user support by the manufacturer has been a drawback; hopefully this will improve as they gain experience in the retail marketplace. My biggest problem to date has been that BASIC is not very basic. Time after time a program meticulously copied from the pages of 'Magical Software' magazine has crashed, registering a 6.8 on the Richter Scale! On the other hand, some of the most satisfying experiences we've had, programming-wise, have been successfully adapting such programs to run well on our machine.

This article is intended to shed a little light on at least the major differences between the OSI C1P's Microsoft BASIC Version 1.0 Revision 3.2 and other versions of BASIC. These comments will also apply to the Superboard and in most cases to the C2-4P (Cassette). Comparisons will be made with the usual versions of BASIC found in the major magazines and programming books, including those residing in Apple, PET, and TRS-80 Level I and II Microcomputers.

The operators used in BASIC can be conveniently divided into six categories for comparison purposes. These are Functions, String Functions, Statements, Expressions (Variables and Operators), and Graphics. The major problems in converting programs will not be found in missing symbols (although a program written for a disc-based machine will have many commands which are incomprehensible to a cassette machine), but in the slight but often significant differences in the actual operation of apparently identical operators.

FUNCTIONS:

In general, the algebraic and trigonometric functions translate well from machine to machine. However, watch for odd ways of handling the conversion from radians to degrees. Some programmers will initialize a variable such as R = 3.14159/180 at the beginning of the program. Others, where the beginning and ending values permit, will stay in radians. In most cases, use of trig functions should be in forms similar to Z = SIN(D*R) or D ± ATN(Z)/R, where D is decimal degrees, Z is the function of the angle, and R is the Degree-Radian conversion.

The RND(X) function may *look* similar in different programs, but the internal random number generator varies substantially. On many computers, using the same 'seed' (the number inside the parentheses) will result in the same sequence of pseudo-random numbers each time the program is initiated. Programs for these machines usually have INPUT statements to allow the user to change the seed. The C1P is, unhappily, not this versatile. Each time the same program is loaded from a fresh start-up after a BREAK-C exactly the same sequence of random numbers occurs. The seed is totally irrelevant. There are several ways around this problem, but the easiest is probably to set up a routine to run-off a bunch of random numbers at the beginning of the program as follows:

```
10 INPUT"Enter time of day";A
20 FOR X = 1 TO A:Y = RND(A):NEXT
30 REM Start main program here
```

In this way, you "waste" a slightly random quantity of random numbers, and your program will have the desired unpredictability.

Several of the other functions such as Memory Available and Integer may have slightly different formats, but will generally run the same. For example the TRS-80 Level I calls up FRE(X) as MEM. So, with abbreviations, our ? FRE(X) becomes P. M. A few functions will be non-existant on the C1P, but can generally be derived. Logarithms and exponentials to an odd base 'A' can be generated by the relationship $\mathrm{LOG}_A(x) = \mathrm{LOG}_e(X)/\mathrm{LOG}_e(A)$, where e is the natural logarithm base 2.71828. Some others such as FIX(X) will require a bit of creativity depending on their use in the program.

STRING FUNCTIONS:

Most BASIC string handling characteristics will be very close, but one can jump up and bite you when you least expect. For example, the function MID$(X$,3,6) will return 6 characters starting at the third character of the string X$ on the C1P. But the TRS-80 Level II will only return the characters 3 through 6. Since this function is very useful for the efficient storage of names of months, days, and other sequential alpha-numeric characters, it is often found in game and business programs. As an illustration, the subroutine below will select the appropriate three characters for the days numbered D = 1 to 7:

```
1010 X$ = "SUNMONTUEWEDTHU
FRISAT"
1020 N = D * 3 - 2
1030 D$ = MID$(X$,N,3)
```

Thus day number '2' results in N = 4 and brings up D$ = "MON". This same method is also used for decimal to hex conversion routines, with hex numbers '0' through 'F' stored as a string, and a loop used to select the position of the desired integer.

STATEMENTS:

Some of the most straightforward statements can get you in the most trouble when converting programs. The FOR - NEXT loop is always identical, right? Wrong! In the following routine, two different results occur depending on your machine's method of identifying loops:

```
10 N = 0
20 FOR X = Y TO Z
30 N = N + 1
40 NEXT
50 PRINT N
```

If Z is greater than Y, everything is fine. If Y = 2 and Z = 4, then N will be 3 (Z - Y + 1). But when Y is equal to or greater than Z, Watch Out! The OSI BASIC will run the loop one time just to find out it's a loop, so N can never be less than 1. Some other machines, especially those using Dartmouth BASIC in 10K or more of ROM, will skip the loop in those cases. To eliminate this problem, a line can be added as follows:

```
25 IF Y > = Z THEN 50
```

One of the most powerful attributes of the C1P is the ability to have multiple-statement lines, using the colon as a delimiter. This appears simple, but can cause a lot of grief. For instance, check the following possibilities:

```
100 IF X = 1 THEN GOTO
140:X = X + 1
200 IF X = 1 THEN X = X +
1:GOTO 140
300 IF X = 1 THEN GOSUB 340:
GOTO 360
```

Two problems enter into play. First, multiple *conditional* statements per line are also supported by the C1P. Thus, the second statement in line 100 will never occur. If X = 1, the program jumps to line 140. If not, it jumps to the next line. Line 200, however, will do both operations if X = 1, and neither if X ≠ 1.

Secondly, GOSUBs RETURN to the next statement on a line. In line 300, the second statement will be executed after a RETURN from the SUB at line 340 when X = 1. This is not always the case on other versions of BASIC. Many will RETURN from a GOSUB to the next line, and any additional dependent statements on the GOSUB line will never be executed. It is necessary to divine the intent of the programmer when such composite statements are encountered.

Another powerful statement on the C1P is INPUT. Note its use as a combination PRINT and INPUT statement in line 10 of the Random Number example above. It can also be used successively with the comma as a delimiter:

```
10 INPUT"Hours, Minutes, and Seconds";
H, M, S
```

Try it - you'll use it often.

EXPRESSIONS - VARIABLES:

Variables should cause little trouble in programming, with the exception of the DIM and MAT functions. In fact, OSI's variables are generally more powerful and easier to work with than most others. The only procedure which won't work is A = B = 0. It must be entered as A = 0 : B = 0. On the other hand, DIM X(11) , Y(12) , etc. will work if the comma is used as a delimiter. Some machines do this with the colon or semicolon as the delimiter; others must have separate statements.

There is, unfortunately, neither an Integer DIM nor a MAT function on the C1P. An Array Integer DIM is a major memory saver where all variables in an array are single digit numbers. Changing DIM A (32) to DIM AI(32) causes the computer to reserve only one Byte per variable rather than four.

The MAT function allows arrays to be established without doing it entry by entry. There are, fortunately, ways around this. The array can be filled most efficiently by the MAT function as follows:

```
10 DIM A(3,3)
20 MAT READ A
30 MAT PRINT A
40 DATA 1,2,3,4,5,6,7,8,9
RUN                  1   2   3
                     4   5   6
                     7   8   9
```

However, on the C1P this can also be done by FOR NEXT loops:

```
10 FOR J = 1 TO 3
20 FOR K = 1 TO 3
30 READ A(J,K)
40 PRINT A(J,K);
50 NEXT K
60 PRINT
70 NEXT J
80 DATA 1,2,3,4,5,6,7,8,9
RUN                  1   2   3
                     4   5   6
                     7   8   9
```

Note that there is considerably less efficiency in the use of program storage memory with the second example. The MAT program would use about 50 Bytes, while the FOR NEXT uses 93. However, there is no further overhead differential with larger arrays.

The DATA function, coupled with FOR NEXT loops and arrays as above can be a very useful memory saver. Consider the example using a string for the days of the week. Another version would be:

```
10 FOR X = 1 TO 7
20 READ D$(X)
30 NEXT X
40DATA"SUN","MON","TUE",
"WED","THU","FRI","SAT"
```

The hard way would be:

```
10D$(1) = "SUN" : D$(2) = "MON"
etc....
```

The READ DATA saves only 10 Bytes of memory in this comparison, but the saving grows rapidly with larger arrays. In a number of cases, programs which exceeded memory capacity on the first pass were successfully run by substituting these more efficient routines.

EXPRESSIONS - OPERATORS:

To date, the only problems encountered with the algebraic and arithmetic operators have involved cases where precedence didn't match. I am fairly certain, however, that these were actually programming glitches rather than machine differences. In any event, watch for such errors. For example, (3*2) + 6 = 12, where 3 * (2 + 6) = 24. The explanation of precedence is probably the only totally complete, clear, and correct section of the C1P BASIC Handbook.

GRAPHICS:

Unfortunately, Graphics is the only almost totally incompatible area between computers. The main reason for this is that BASIC doesn't really support graphics; various character generator ROM's are used, with additional variances in addressing modes. My best suggestion is to try to divine the intent of the program author and recreate it from scratch. Such commands as TRS-80's PRINTAT or the various screen formatting functions just won't translate. Other missing links are CLS, POINT, SET, and RESET.

This is not all bad. The extensive set of graphics characters of the C1P, coupled with the relative ease of their use through POKE and loops, more than compensates.

There is no question that the above notes are far from all-inclusive. Hardly a week passes that I don't make a new entry in my loose-leaf program file. But each new problem adds to our knowledge and ability, and each new program is easier to get up and running. I would enjoy hearing reader experiences on this subject; any of general interest will be passed on in these pages.

PROOFREAD

Ralph Kelley
7551 Marshall Drive
Annandale, VA 22003

You've just manually keyed in a long program. Before running it you must check it for correctness. PROOFREAD makes the job easier. Instead of showing one byte at a time, PROOFREAD displays complete instructions of one, two, or three bytes. A very efficient section of coding (25 bytes) analyzes opcodes to determine the number of bytes in the instruction.

PROOFREAD has three advantages:

(1) It is completely relocatable.
(2) It is short; it even fits into that block of user RAM at $1780.
(3) It won't wipe out part of your program; it's use of memory is compatible with all other programs.

To use PROOFREAD you must store the starting address of the program you want to examine in $17F5 and $17F6. PROOFREAD starts at $1780.

Pressing any key (except O, E, and F) will cause an advance to show the next instruction. If you hold the key down you will see the address and opcode in the standard KIM format. When you release the key you will see the complete instruction.

The O key causes a return to and display of the first instruction.

The E key causes an exit to the KIM monitor -- to correct an error, for example. If you re-enter PROOFREAD at $1783 you can continue with the next instruction without having to return to the beginning.

The F key provides a fast forward capability. Hold down the F key and PROOFREAD will scan forward until a one-byte instruction is found and then stop showing the address and opcode of the next instruction. Release the key to see the complete instruction.

```
                 0010 INTVEB      .DE $1932
                 0020 VEB         .DE $17EC
                 0030 POINTL      .DE $FA
                 0040 POINTH      .DE $FB
                 0050 SCAND       .DE $1F19
                 0060 SCAND1      .DE $1F28
                 0070 SCANDS      .DE $1F1F
                 0080 BYTES       .DE $F8
                 0090 INCVEB      .DE $19EA
                 0100 PADD        .DE $1741
                 0110 GETKEY      .DE $1F6A
                 0120 KIM         .DE $1C4F
                 0130 ;
                 0140 ;
                 0150             .BA $1780
1780- 20 32 19   0160 RESET       JSR INTVEB    ;INITIALIZE POINTER.
1783- D8         0170 CONTINUE    CLD
1784- A9 AD      0180             LDA #$AD      ;SET UP VOLITILE
1786- 8D EC 17   0190             STA VEB       ;EXECUTION BLOCK
1789- AD ED 17   0200             LDA VEB+1     ;STORE
178C- 85 FA      0210             STA *POINTL   ;   ADDRESS
178E- AD EE 17   0220             LDA VEB+2     ;      FOR
1791- 85 FB      0230             STA *POINTH   ;         DISPLAY.
1793- 20 19 1F   0240 SHOWAD      JSR SCAND     ;DISPLAY ADDRESS
1796- D0 FB      0250             BNE SHOWAD    ;   UNTIL KEY RELEASE.
1798- 20 EC 17   0260 GETOP       JSR VEB       ;GET OPCODE.
179B- A2 01      0270             LDX #$01      ;ANALYZE OPCODE:
179D- C9 20      0280             CMP #$20      ;IF OPCODE IS $20
179F- F0 11      0290             BEQ THREE     ;   THEN THREE BYTES.
17A1- 29 9F      0300             AND #$9F      ;CLEAR OPBITS 5 & 6
17A3- F0 0F      0310             BEQ ONE       ;IF $00,40,60 THEN ONE.
17A5- 0A         0320             ASL A         ;CLEAR OPBIT 7.
17A6- C9 12      0330             CMP #$12      ;COMPARE OPCODE TO $09;
17A8- F0 09      0340             BEQ TWO       ;   IF EQUAL THEN TWO.
17AA- 29 DB      0350             AND #$DB      ;CLEAR OPBITS 4 & 1.
17AC- C9 10      0360             CMP #$10      ;COMPARE TO $-8 (AND $-A):
17AE- F0 04      0370             BEQ ONE       ;   IF EQUAL THEN ONE;
17B0- 90 01      0380             BCC TWO       ;   IF LESS THEN TWO;
17B2- E8         0390 THREE       INX  ;            OTHERWISE THREE.
17B3- E8         0400 TWO         INX
17B4- 86 F8      0410 ONE         STX *BYTES    ;SAVE BYTES.
17B6- 20 EC 17   0420 DISPLAY     JSR VEB       ;LOAD ALL BYTES
17B9- 95 F8      0430             STA *BYTES,X        ;OF
17BB- 20 EA 19   0440             JSR INCVEB    ;       INSTRUCTION
17BE- CA         0450             DEX  ;                INTO DISPLAY
17BF- D0 F5      0560             BNE DISPLAY   ;          AREA.
17C1- A9 7F      0570 SHOWINS     LDA #$7F      ;DISPLAY
17C3- 8D 41 17   0580             STA PADD      ;   COMPLETE
17C6- A2 09      0590             LDX #$09      ;       INSTRUCTION
17C8- A4 F8      0600             LDY *BYTES    ;         WHILE WAITING
17CA- 20 28 1F   0610             JSR SCAND1    ;            FOR NEXT
17CD- F0 F2      0620             BEQ SHOWINS   ;               KEY.
17CF- 20 1F 1F   0630             JSR SCANDS    ;DEBOUNCE.
17D2- 20 6A 1F   0640             JSR GETKEY
17D5- A8         0650             TAY  ;         ADJUST ZERO FLAG.
17D6- F0 A8      0660             BEQ RESET     ;ZERO RESETS POINTER.
17D8- C9 0F      0670             CMP #$0F      ;F CAUSES FAST
17DA- D0 04      0680             BNE OVER      ;   SCAN TO NEXT
17DC- C6 F8      0690             DEC *BYTES    ;       ONE-BYTE
17DE- D0 B8      0700             BNE GETOP     ;           INSTRUCTION.
17E0- C9 0E      0710 OVER        CMP #$0E      ;E CAUSES
17E2- D0 9F      0720             BNE CONTINUE        ;EXIT TO
17E4- 4C 4F 1C   0730 OUT         JMP KIM       ;       MONITOR.
                 0740             .EN
```

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TWO NOTES ON THE PULSE-COUNTING MODE OF TIMER 2 ON THE 6522

Marvin L. De Jong
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The School of the Ozarks
Pt. Lookout, MO 65726

Since the specifications on the 6522 indicate that, in order to be counted, a pulse must be a logic zero on the positive transition of the 0_2 clock, the theoretical maximum counting rate is one-half of the system clock frequency. In microcomputer systems with a one MHz clock frequency, the maximum rate at which pulses can be applied to pin PB6 and not be missed by the counting logic on the 6522 is 500kHz. In practice, the maximum frequency will be somewhat less than 500 kHz.

All of the specification sheets that I have on the 6522 indicate that the interrupt flag is set (IRQ goes to logic zero) after N negative pulses occur on PB6, where N is the 16-bit number loaded into the T2 counter. My own experiments, using the short AIM disassembly listing given below, indicate that N + 1 pulses must occur before the interrupt flag is set. The reason for this is that the counter counts through zero rather than to zero. In the program below the counter is loaded with $05, but I always find that $06 pulses are required to produce the interrupt. Note that the high-order byte in the counter is $00.

```
0200 58 CLI
0201 A9 LDA #A0
0203 8D STA A00E
0206 A9 LDA #20
0208 8D STA A00B
020B A9 LDA #05
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0210 A9 LDA #00
0212 8D STA A009
0215 4C JMP 0215
```

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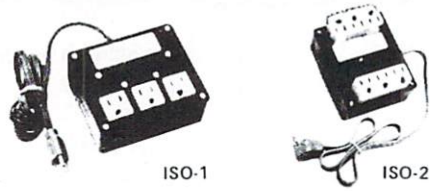

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Tokens in OSI Basic

Barry L. Beal
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As a OSI C1P owner, I'm glad that you have decided to support the OSI systems. Enclosed is some BASIC stuff that might interest other frustrated OSI owners like myself. My version of the Microsoft BASIC is ver 1.0 rev 3.2. Upon disassembling the BASIC ROM, I found that it is written by Richard W. Weiland.

OSI BASIC USES RAM memory from $0300 to the end of RAM available (unless the answer to MEMORY SIZE? is not the standard cr.). Note: that P-DOS gives you 8K from $2100 to $22FA and 65DV3. 0 uses from $317E to the end of RAM. The Maximum address being $7FFF, although I don't see why it can't go to $A000, the start of the BASIC*IN*ROM. The BASIC ROM makes use of four fields in storing each BASIC STATEMENT: (1) a 00 byte to mark the start of the next line; (2) two byte field indicating the start of the next line (this address is actually the address of the next forward reference in the BASIC forward linked storage scheme); (3) a two byte line number field where the line number is stored as its hex equivalent (low, high format); and (4) n bytes containing the BASIC statement expressed as tokens, ASCII CODES, etc. The codes $01 to $1F are the appropriate OSI graphics characters when they are listed (they would only be in the BASIC statement field if someone mistakenly put them there). The codes $20 to $7F are the corresponding ASCII CODES, they are used to represent the line numbers, variable names, etc. that are not BASIC tokens. The codes $80 to $FE correspond to the tokens list here on a separate page. $FF is the corresponding graphics character. For example 1 REM**EXAMPLE would be represented as 00 XX XX 01 00 8E 2A 2A 45 58 41 4D 50 4C 45. The following is the vector table for my C1P:

```
Monitor       JUMP $FE00         $FFEB    JMP ($0218)
WARM START    JUMP $0000         $FFEF    JMP ($021A)
COLD START    JUMP $BD11         $FFF1    JMP ($021C)
DISK BOOT     JUMP $FC00         $FFF4    JMP ($021E)
                                 $FFF7    JMP ($0220)

RESTART VECTOR   $FF00
NMI VECTOR       $0130
IRQ VECTOR       $01C0  (also break vector)
```

Note: NMI AND IRQ VECTOR locations should point to the appropriate routine. (Remember these locations are in the stack so watch the stack ptr.)

More BASIC info of interest. The following addresses might come of handy:

0000	jump for warm start (should be 4C 74 A2)
0003	Ok, input command vector (should be 4C C3 A8)
000B	low, high USR VECTOR
000F	TERMINAL WIDTH (standardly 72 decimal of hex 48)
0011-005F	72 bytes for storage of BASIC statements
0079,007A	appears to be start of RAM memory used by BASIC
0081,0082	appears to be end of useable RAM

Note: that by making the changes for memory locations $0000 to $0005 that one can exit the cold-start routine when one doesn't want to destroy what's in memory because of accidently pressing (break) C; instead of W.

I hope this information inspires other OSI owners to write in about the various secrets about the C1P and C2-4P machines that OSI forgot to mention. SUCH lack of documentation is apt to scare away many potential buyers of this very useful computer.

OSI BASIC VER 1.0 REV 3.2 TOKENS

TOKENS	EQUIVALENT	TOKENS	EQUIVALENT	TOKENS	EQUIVALENT
$80	END	$81	FOR	$82	NEXT
$83	DATA	$84	INPUT	$85	DIM
$86	READ	$87	LET(opt)	$88	GOTO
$89	RUN	$8A	IF	$8B	RESTORE
$8C	GOSUB	$8D	RETURN	$8E	REM
$8F	STOP	$90	ON	$91	NULL
$92	WAIT	$93	LOAD	$94	SAVE
$95	DEF	$96	POKE	$97	PRINT
$98	DONT	$99	LIST	$9A	CLEAR (variables)
$9B	NEW	$9C	TAB(	$9D	TO
$9E	FN	$9F	SPC	$A0	THEN
$A1	NOT	$A2	STEP	$A3	+
$A4	-	$A5	*	$A6	/
$A7	^	$A8	AND	$A9	OR
$AA	>	$AB	=	$AC	<
$AD	SGN	$AE	INT	$AF	ABS
$B0	USR	$B1	FRE	$B2	POS
$B3	SQR	$B4	RND	$B5	LOG
$B6	EXP	$B7	COS	$B8	SIN
$B9	TAN	$BA	ATN	$BB	PEEK
$BC	LEN	$BD	STR$	$BE	VAL
$BF	ASC	$C0	CHR$	$C1	LEFT$
$C2	RIGHT$	$C3	MID$	$C4	(

FROM $C4 TO $D3 BASIC ERROR CODES

TOKENS	EQUIVALENT	TOKENS	EQUIVALENT	TOKENS	EQUIVALENT
$C5	SN	$C6	RG	$C7	OD
$C8	FC	$C9	OV	$CA	OM
$CB	US	$CC	BS	$CD	DD
$CE	/0	$CF	ID	$D0	TM
$D1	LS	$D2	ST	$D3	CN

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